ISO

NATIONAL

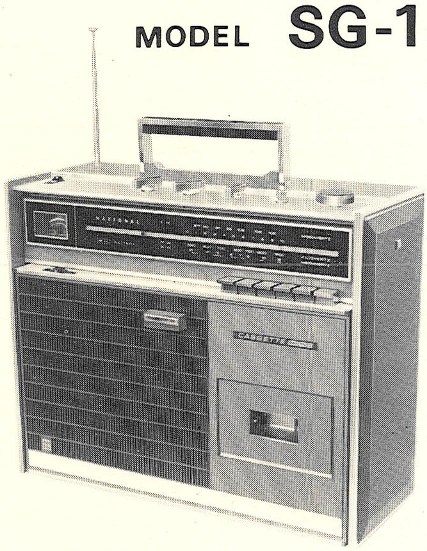
National

NATIONAL Service Manual

ORDER NO. SDT-151

3-BAND 20-TRANSISTOR 16-DIODE AC/BATTERY POWERED RADIO-PHONOGRAPH WITH CASSETTE TAPE RECORDER

MODEL SG-149F



SPECIFICATIONS

Frequency Range:	FM	87.5 ~ 108 MHz (3.43 ~ 2.78 m)
	AM	525 ~ 1605 kHz (571 ~ 187 m)
	SW	5.9 ~ 18 MHz (50.8 ~ 16.6 m)
	[SW	3.9 ~ 12 MHz (77 ~ 25 m) . . . SA]
Intermediate Frequency:	FM	10.7 MHz
	AM	455 kHz
Transistors:	2SC921	FM RF Amplifier
	2SC920	FM Converter
	2SC829	FM 1st IF Amp. & AM Converter
	2SC829	FM 2nd IF Amp. & AM 1st IF Amp.
	2SC829	FM 3rd IF Amp. & AM 2nd IF Amp.
	2SC346	1st AF Amplifier
	2SC828	2nd AF Amplifier
	2SB405	Power Output
	2SD72	Power Output
	2SB346	Equalizer Pre-amp.
	2SB175	Equalizer Pre-amp.
	2SB175	Equalizer Amp. (two)
	2SB175	AC Bias Oscillator
	2SB324	AC Bias Power Amp.
	2SB175	Level Meter Amp.
	2SC828	Motor Governor Control (two)
	2SB324	Motor Governor Control (two)
Diodes:	0A90	FM Forward AGC
	0A90	FM Discriminator (two)
	0A90	FM Meter Det.
	0A90	FM D. AGC
	0A90	AM Det. & AGC
	1S1211	AOC (seven)
	10D-1	AC/Battery Switching
	10D-1	AC Lamp Switching
	10DC-1R	Rectifier
Thermistors:	MT-10K	Temperature Compensator
	ERT-D3FBK350S	Temperature Compensator
Sensitivity:	FM	2μV/m/50mW
	MW	100μV/m/50mW
	SW	50μV/m/50mW
Power Output:	2W (Maximum)	
Power Source:	AC 110V, 125V, 210V, 240V, 50 ~ 60Hz	
Batteries	Six "D" size flashlight batteries (9V) (NATIONAL UM-1 or equivalent)	
Speakers:	10 cm PM Dynamic 4Ω	
	6.5 cm PM Dynamic 8Ω	
Pickup:	EPU-65LTC with cartridge	
Cartridge:	EPC-70LTC with stylus, Ceramic	
Stylus:	EPS-04LP	
Phonomotor:	FF-553D (9V) 2 Speed DC Phonomotor Transistorized Governor Controlled	
Record/Playback Head:	WY-027Z	
Erase Head:	WY-235X	
Cassette Motor:	MHE-5SD9S2 (DC 9V) Transistorized Governor Controlled	
Cabinet Dimensions:	373 (W) x 154 (D) x 324 (H) mm (14-11/16) (6-1/16") (12-3/4")	
Weight:	6.1 kg. (13 lb. 7 oz.) without batteries	

<EXPORT DIVISION>
MATSUSHITA ELECTRIC TRADING CO., LTD.
P. O. Box 288, Central Osaka, Japan

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
RADIO and STEREO DIVISION

CONTENTS

Page

PARTS IDENTIFICATION . . . . 2 - 5

DISASSEMBLY INSTRUCTIONS 6

- To Remove Chassis 6
- To Remove Speaker 6
- To Remove Phonomotor 7
- To Remove Tweeter 7

SCHEMATIC DIAGRAM 8

CIRCUIT BOARD & ALIGNMENT POINT-RADIO 9

CIRCUIT BOARD & ALIGNMENT POINT-TAPE RECORDER 10

ALIGNMENT INSTRUCTIONS-RADIO . . . . 11 - 12

CIRCUIT BOARD 13

ADJUSTMENT OF LEVEL METER 15

DIAL CORD STRINGING GUIDE 15

ALIGNMENT INSTRUCTIONS-TAPE RECORDER 16

MECHANICAL ADJUSTMENT-TAPE RECORDER 17

TAPE TRANSPORT OPERATIONS 18

PARTS IDENTIFICATION-TAPE DECK 19

EXPLODED VIEW-TAPE DECK 20

TAPE RECORDER CIRCUITS . . . . 21 - 22

REPLACING CARTRIDGE AND STYLUS 23

REPLACEMENT PARTS LIST . . . . 24 - 31

CASSETTE TAPERECORDER REPLACEMENT PARTS LIST 32

PARTS IDENTIFICATION

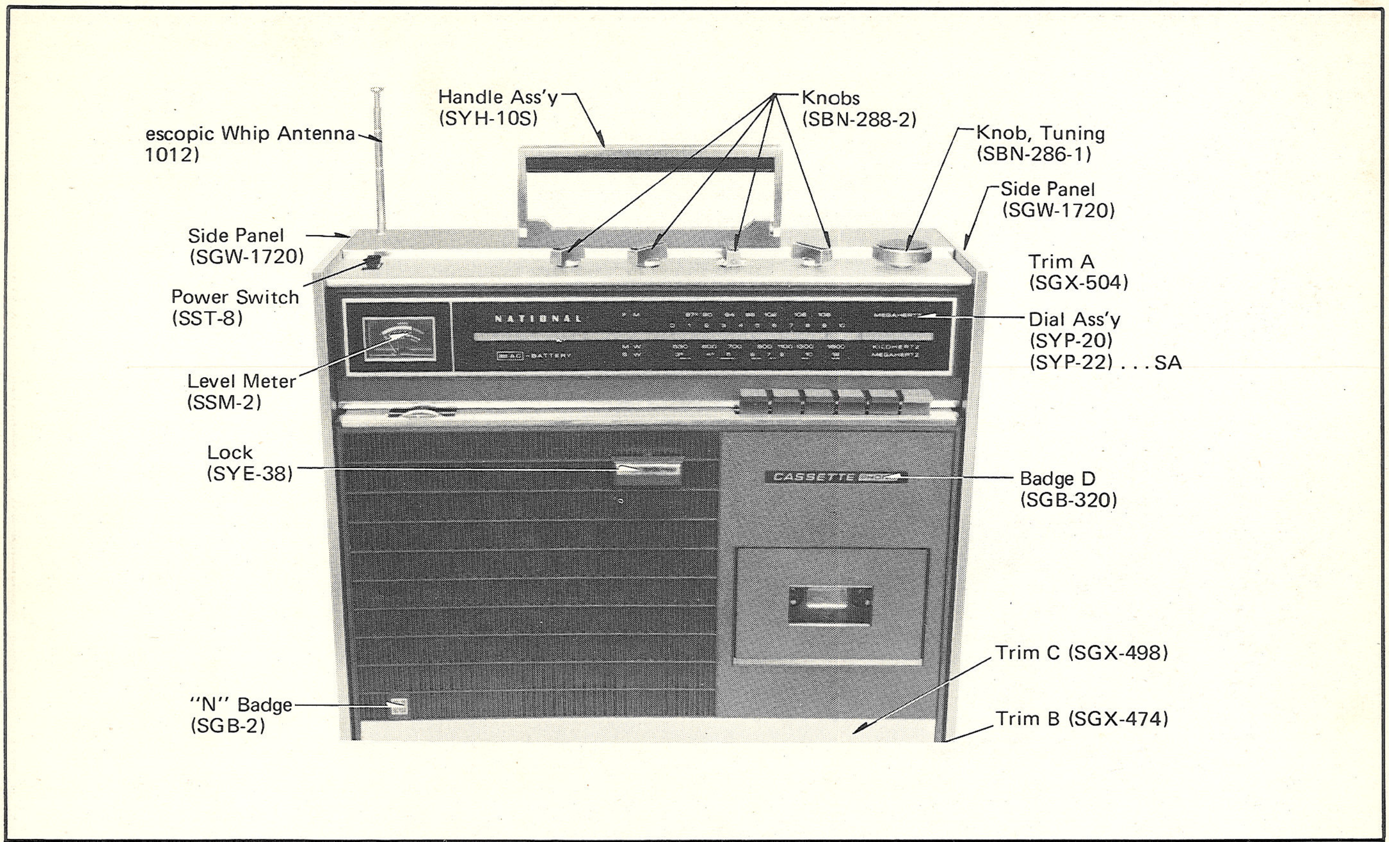

escopic Whip Antenna
1012)
Handle Ass'y
(SYH-10S)
Knobs
(SBN-288-2)
Knob, Tuning
(SBN-286-1)
Side Panel
(SGW-1720)
Side Panel
(SGW-1720)
Trim A
(SGX-504)
Power Switch
(SST-8)
Dial Ass'y
(SYP-20)
(SYP-22) . . . SA
Level Meter
(SSM-2)
Lock
(SYE-38)
Badge D
(SGB-320)
Trim C (SGX-498)
"N" Badge
(SGB-2)
Trim B (SGX-474)

Fig. 1 FRONT VIEW

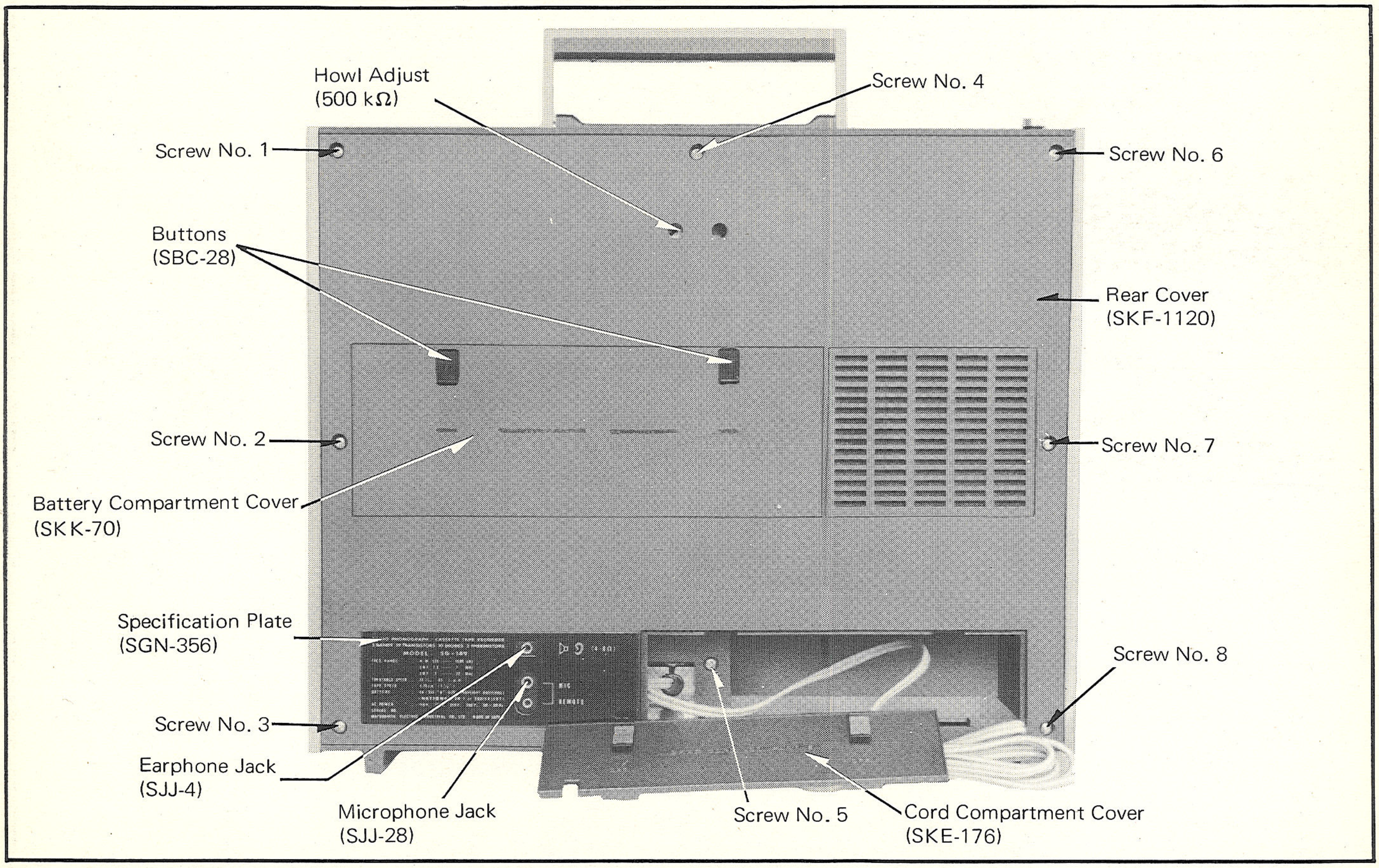

Howl Adjust
(500 kΩ)
Screw No. 4
Screw No. 1
Screw No. 6
Buttons
(SBC-28)
Rear Cover
(SKF-1120)
Screw No. 2
Screw No. 7
Battery Compartment Cover
(SKK-70)
Specification Plate
(SGN-356)
Screw No. 8
Screw No. 3
Earphone Jack
(SJJ-4)
Microphone Jack
(SJJ-28)
Screw No. 5
Cord Compartment Cover
(SKE-176)

Fig. 2 REAR VIEW

PARTS IDENTIFICATION

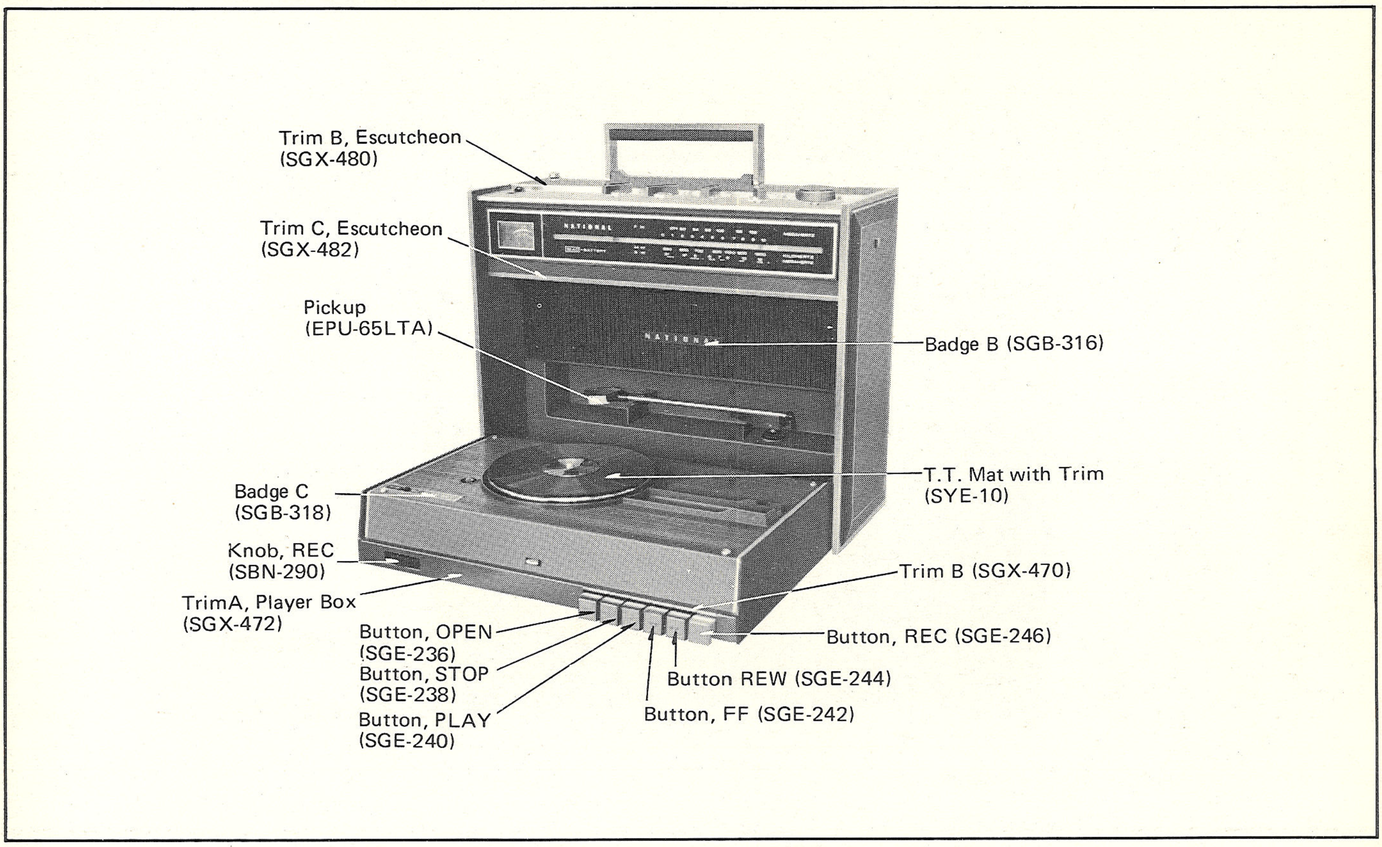

Trim B, Escutcheon
(SGX-480)
Trim C, Escutcheon
(SGX-482)
Pickup
(EPU-65LTA)
Badge B (SGB-316)
T.T. Mat with Trim
(SYE-10)
Badge C
(SGB-318)
Knob, REC
(SBN-290)
TrimA, Player Box
(SGX-472)
Trim B (SGX-470)
Button, OPEN
(SGE-236)
Button, STOP
(SGE-238)
Button, PLAY
(SGE-240)
Button, REC (SGE-246)
Button REW (SGE-244)
Button, FF (SGE-242)

Fig. 3 FRONT VIEW WITH PLAYER BOX OPEN

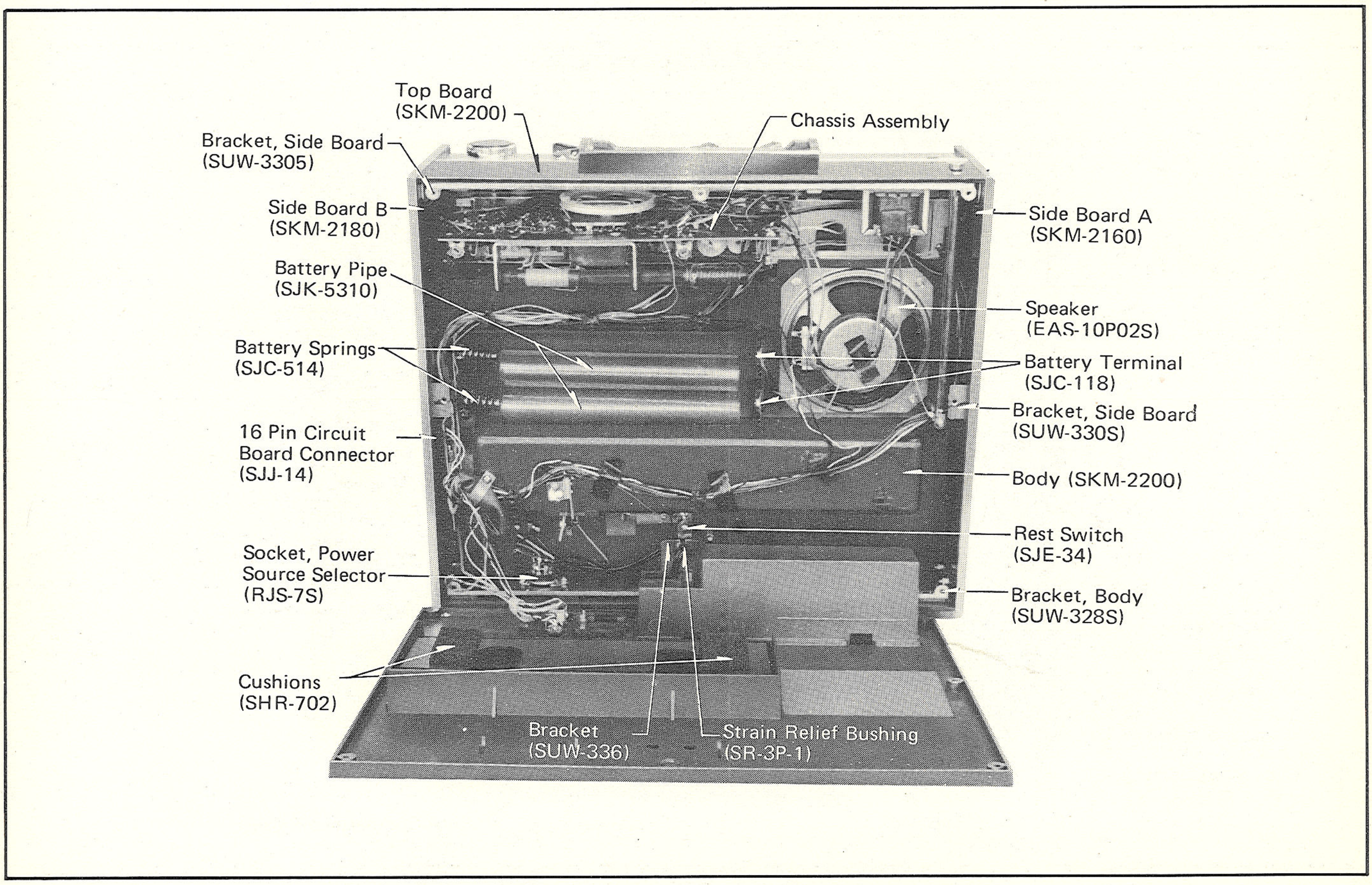

Top Board
(SKM-2200)
Chassis Assembly
Bracket, Side Board
(SUW-3305)
Side Board B
(SKM-2180)
Side Board A
(SKM-2160)
Battery Pipe
(SJK-5310)
Speaker
(EAS-10P02S)
Battery Springs
(SJC-514)
Battery Terminal
(SJC-118)
Bracket, Side Board
(SUW-330S)
16 Pin Circuit
Board Connector
(SJJ-14)
Body (SKM-2200)
Rest Switch
(SJE-34)
Socket, Power
Source Selector
(RJS-7S)
Bracket, Body
(SUW-328S)
Cushions
(SHR-702)
Bracket
(SUW-336)
Strain Relief Bushing
(SR-3P-1)

Fig. 4 REAR VIEW WITH REAR COVER OPEN

PARTS IDENTIFICATION

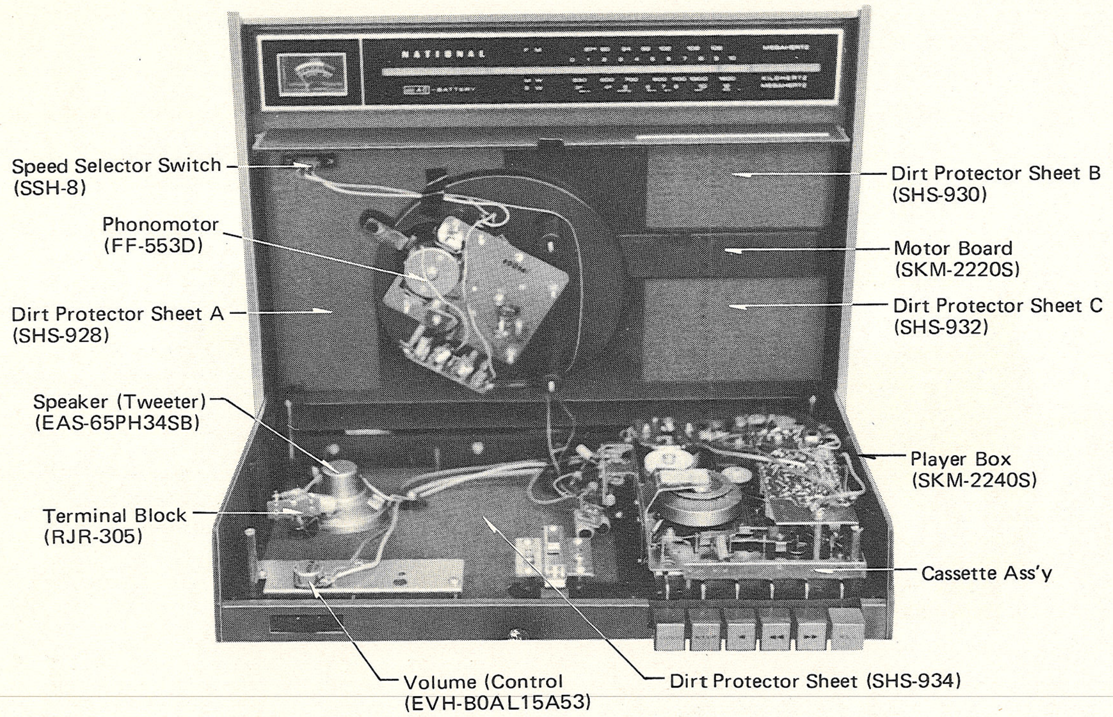

NATIONAL
Speed Selector Switch (SSH-8)
Phonomotor (FF-553D)
Dirt Protector Sheet A (SHS-928)
Speaker (Tweeter) (EAS-65PH34SB)
Terminal Block (RJR-305)
Volume (Control (EVH-B0AL15A53)
Dirt Protector Sheet (SHS-934)
Dirt Protector Sheet B (SHS-930)
Motor Board (SKM-2220S)
Dirt Protector Sheet C (SHS-932)
Player Box (SKM-2240S)
Cassette Ass'y

Fig. 5 FRONT VIEW WITH MOTOR BOARD OPEN

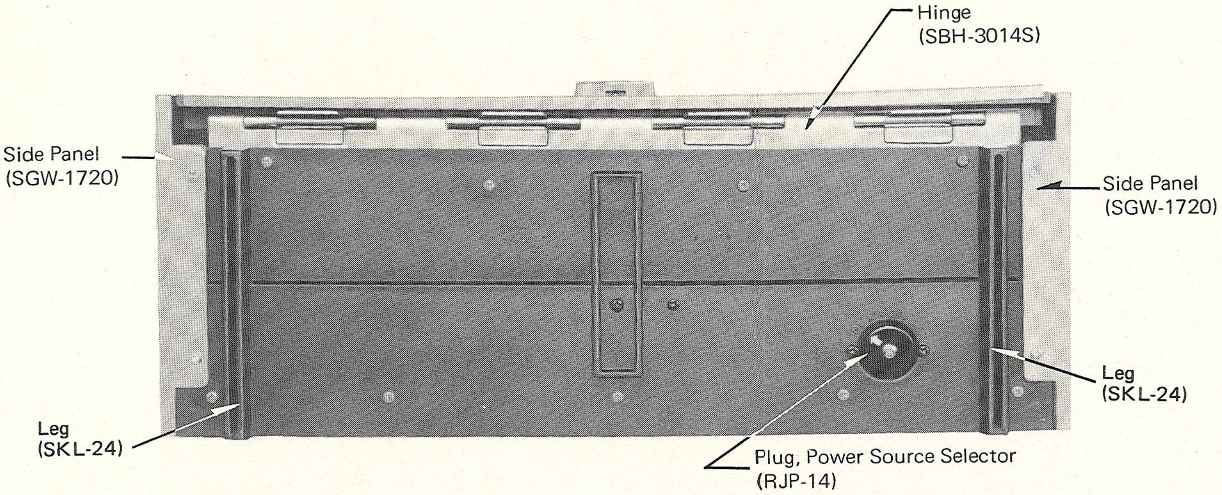

Hinge (SBH-3014S)
Side Panel (SGW-1720)
Side Panel (SGW-1720)
Leg (SKL-24)
Leg (SKL-24)
Plug, Power Source Selector (RJP-14)

Fig. 6 BOTTOM VIEW

PARTS IDENTIFICATION

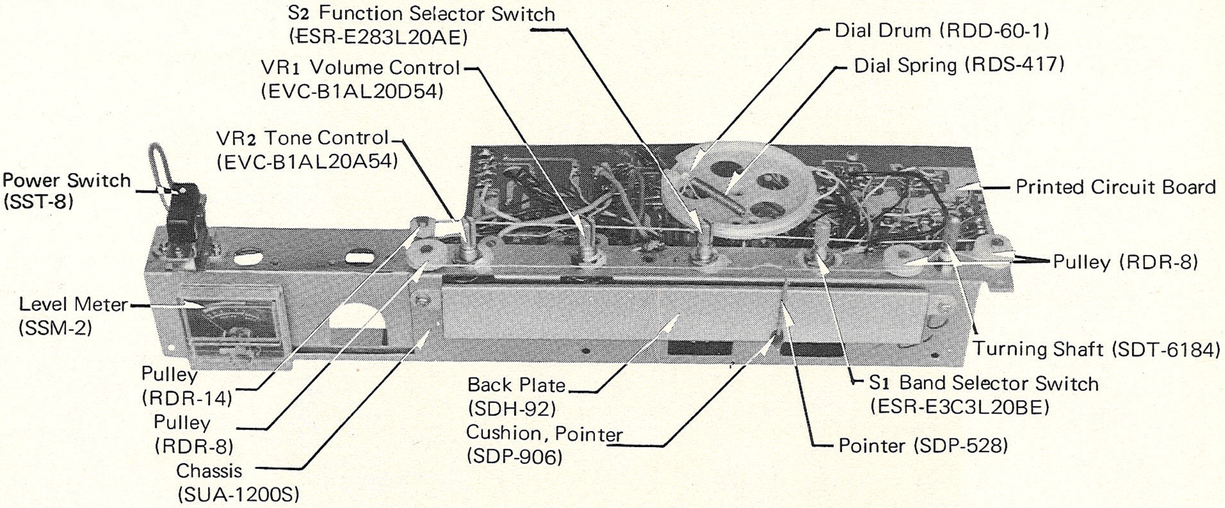

S2 Function Selector Switch
(ESR-E283L20AE)
VR1 Volume Control
(EVC-B1AL20D54)
VR2 Tone Control
(EVC-B1AL20A54)
Power Switch
(SST-8)
Level Meter
(SSM-2)
Pulley
(RDR-14)
Pulley
(RDR-8)
Chassis
(SUA-1200S)
Back Plate
(SDH-92)
Cushion, Pointer
(SDP-906)
Dial Drum (RDD-60-1)
Dial Spring (RDS-417)
Printed Circuit Board
Pulley (RDR-8)
Turning Shaft (SDT-6184)
S1 Band Selector Switch
(ESR-E3C3L20BE)
Pointer (SDP-528)

Fig. 7 CHASSIS

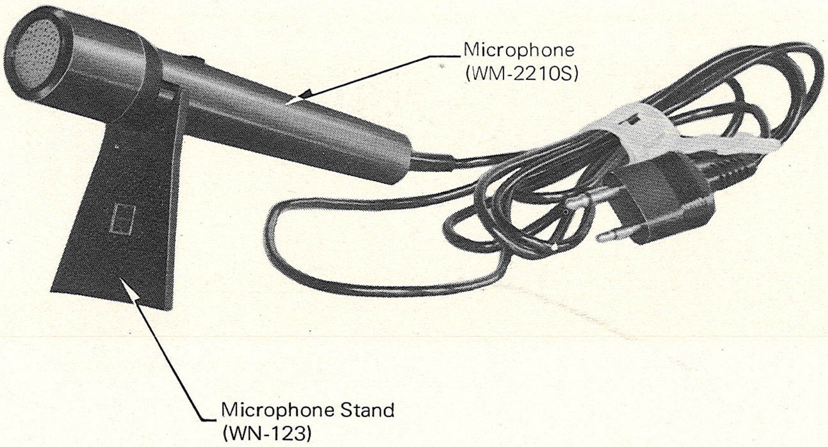

Microphone
(WM-2210S)
Microphone Stand
(WN-123)

Fig. 8 MICROPHONE & STAND

DISASSEMBLY INSTRUCTIONS

To Remove Chassis (Refer to Figs. 2, 9 & 10)

1. Remove eight (8) rear cover mounting screws, Nos. 1-8 as shown in Fig. 2 on page 2.
2. Remove three (3) escutcheon mounting screws, Nos. 1-3 as shown in Fig. 9.
3. Remove five (5) knobs from escutcheon.
4. Remove two (2) chassis mounting screws, Nos. 1-2, as shown in Fig. 10.
5. To remove chassis completely, remove six (6) chassis mounting screws Nos. 3-8 from escutcheon, as shown in Fig. 10.

   Pull out 16 pin circuit board connector from circuit board connecting board (SUP-2320) and remove microphone jack, earphone jack.

   Then unsolder ten (10) lead wires to speaker (black), battery terminal (red), telescopic whip antenna (orange), power source selector socket (red, green, blue & yellow), battery spring (black), rest switch (black) and terminal (black).
6. To reassemble, reverse above procedure.

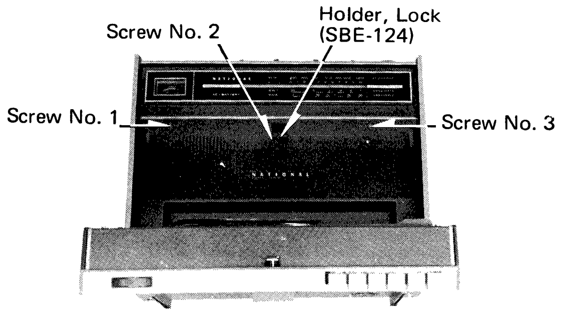

Screw No. 2
Holder, Lock (SBE-124)
Screw No. 1
Screw No. 3

Fig. 9

To Remove Speaker (Refer to Figs. 2 & 10)

1. Remove eight (8) rear cover mounting screws, Nos. 1-8 as shown in Fig. 2 on page 2.
2. Remove four (4) speaker mounting nuts, Nos. 1-4 as shown in Fig. 10.
3. Unsolder two (2) lead wires (white & black).
4. To reassemble, reverse above procedure.

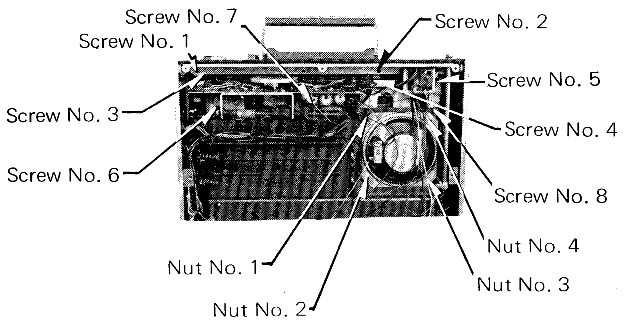

Screw No. 7
Screw No. 1
Screw No. 2
Screw No. 5
Screw No. 3
Screw No. 4
Screw No. 6
Screw No. 8
Nut No. 4
Nut No. 1
Nut No. 3
Nut No. 2

Fig. 10

DISASSEMBLY INSTRUCTIONS

To Remove Phonomotor (Refer to Figs. 11 & 12)

1. Remove turntable mat and circlip from turntable.
2. Remove six (6) motor board mounting screws, Nos. 1-6 as shown in Fig. 11.
3. Remove four (4) phonomotor mounting nuts, Nos. 1-4 as shown in Fig. 12.
4. Unsolder five (5) lead wires to switch (blue, yellow & white) and governor circuit (orange & red).
5. To reassemble, reverse above procedure.

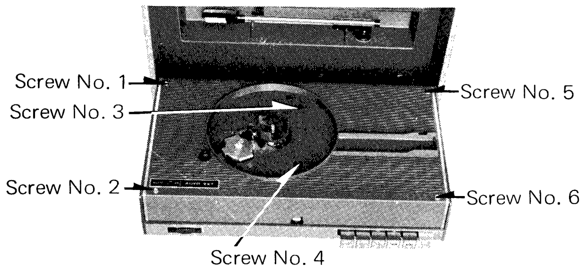

Screw No. 1
Screw No. 3
Screw No. 2
Screw No. 5
Screw No. 6
Screw No. 4

Fig. 11

To Remove Cassette Tape Deck (Refer to Figs. 11 & 12)

1. Remove six (6) motor board mounting screws, Nos. 1-6 as shown in Fig. 11.
2. Remove two (2) cassette tape deck mounting screws Nos. 1-2 and the stud as shown in Fig. 12.
3. To remove cassette tape deck completely, unsolder eight (8) lead wires to circuit connecting board (grey, grey brown, orange & green), level control (grey & brown) and terminal block (green).
4. To reassemble, reverse above procedure.

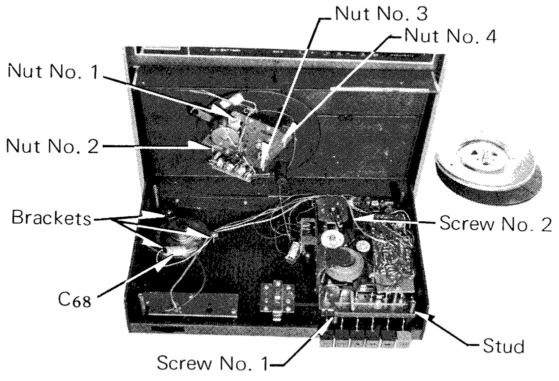
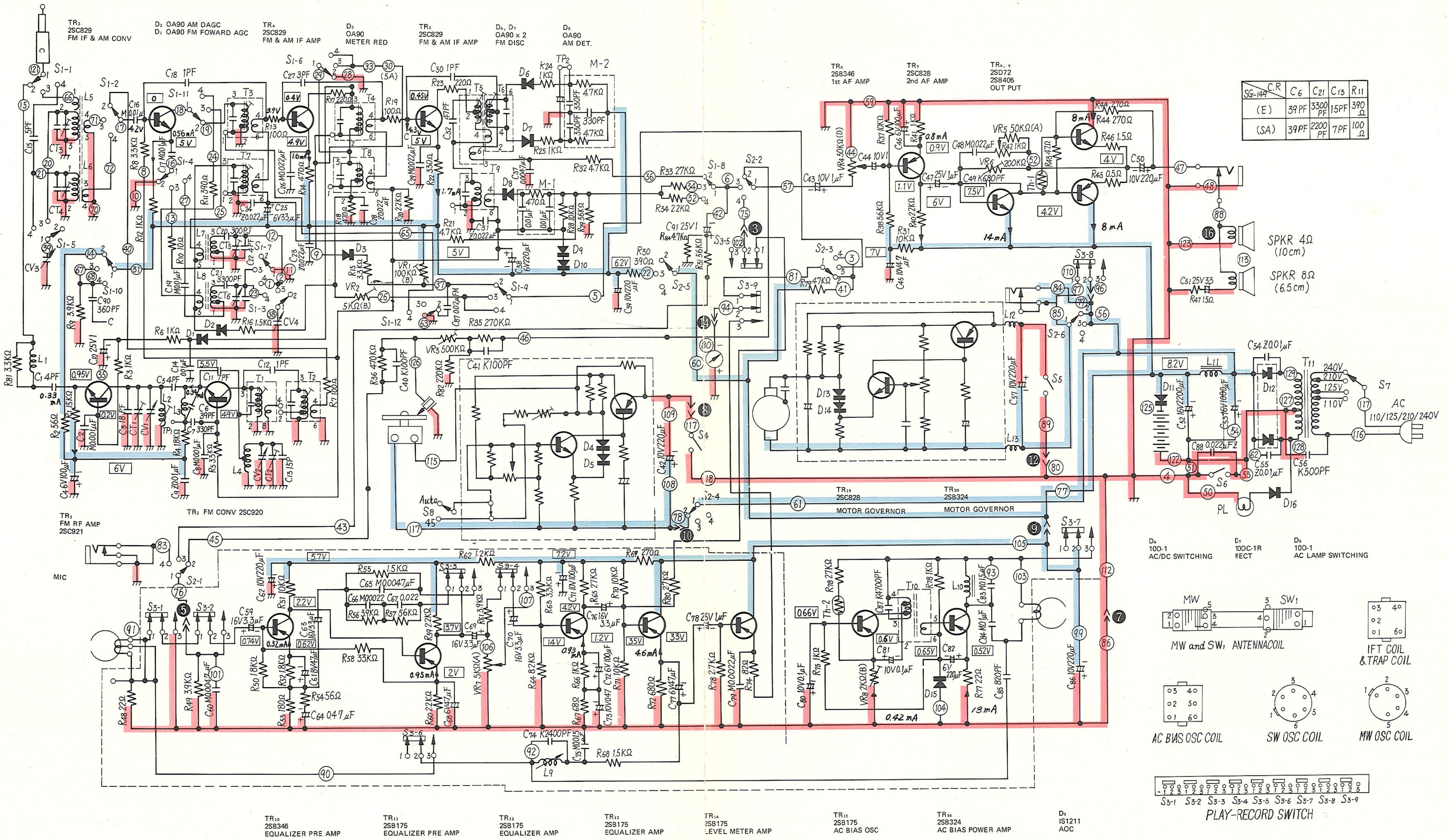

Nut No. 3
Nut No. 4
Nut No. 1
Nut No. 2
Brackets
Screw No. 2
C68
Stud
Screw No. 1

Fig. 12

To Remove Tweeter (Refer to Figs. 11 & 12)

1. Remove six (6) motor board mounting screws, Nos. 1-6 as shown in Fig. 11.
2. Remove three (3) tweeter mounting brackets, as shown in Fig. 12.
3. Unsolder lead wire to circuit connecting board (black) and capacitor (C_{68}) to terminal block.
4. To reassemble, reverse above procedure.

SCHEMATIC DIAGRAM MODEL SG-149F

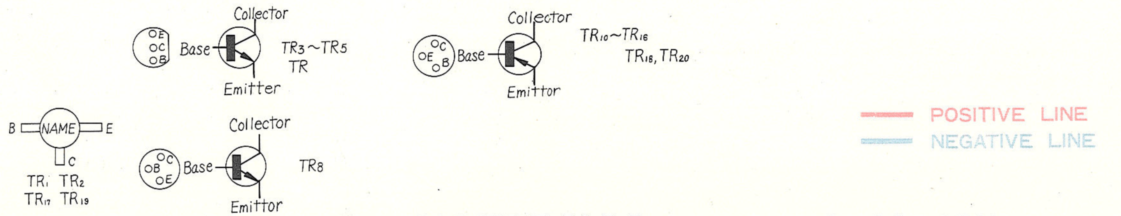

TR₃ 2SC829 FM IF & AM CONV
D₂ OA90 AM DAGC
D₁ OA90 FM FOWARD AGC
TR₄ 2SC829 FM & AM IF AMP
D₃ OA90 METER RED
TR₅ 2SC829 FM & AM IF AMP
D₆, D₇ OA90 x 2 FM DISC
D₈ OA90 AM DET.
TR₆ 2SB346 1st AF AMP
TR₇ 2SC828 2nd AF AMP
TR₈, ₉ 2SD72 2SB405 OUT PUT
SPKR 4Ω (10cm)
SPKR 8Ω (6.5cm)
AC 110/125/210/240V
S₇
PL
D16
TR₁ FM RF AMP 2SC921
TR₂ FM CONV 2SC920
MIC
TR₁₉ 2SC828 MOTOR GOVERNOR
TR₂₀ 2SB324 MOTOR GOVERNOR
D₆ 10D-1 AC/DC SWITCHING
D₇ 10DC-1R RECT
D₈ 10D-1 AC LAMP SWITCHING
MW
SW₁
MW and SW₁ ANTENNACOIL
IFT COIL & TRAP COIL
AC BIAS OSC COIL
SW OSC COIL
MW OSC COIL
S3-1 S3-2 S3-3 S3-4 S3-5 S3-6 S3-7 S3-8 S3-9
PLAY-RECORD SWITCH
TR₁₀ 2SB346 EQUALIZER PRE AMP
TR₁₁ 2SB175 EQUALIZER PRE AMP
TR₁₂ 2SB175 EQUALIZER AMP
TR₁₃ 2SB175 EQUALIZER AMP
TR₁₄ 2SB175 LEVEL METER AMP
TR₁₅ 2SB175 AC BIAS OSC
TR₁₆ 2SB324 AC BIAS POWER AMP
D₅ IS1211 AOC

SG-149 \ C.R	C₆	C₂₁	C₁₃	R₁₁
(E)	39PF	3300PF	15PF	390Ω
(SA)	39PF	2200PF	7PF	100Ω

C	15 10 16 90 17 5 9 7 6 8 11 25 59 12 13 27 61 63 28 65 40 29 30 87 74 71 72 91 81 82 83 88
	1 4 3 2 19 18 20 21 60 24 22 67 25 26 23 64 66 67 68 32 31 68 41 70 37 24 25 75 73 76 39 42 77 78 79 80 43 44 45 46 47 48 49 84 85 57 86 50 52 51 53 54 55 56
R	2 1 3 12 8 6 4 5 16 13 14 54 7 18 15 10 20 22 23 21 82 24 25 28 32 30 69 33 34 84 31 73 74 79 75 37 38 39 40 41 42 43 44 45 46 47
	81 48 10 11 49 50 51 52 53 17 58 35 56 55 57 59 60 61 62 63 64 29 65 66 67 68 70 71 72 80 76 78 77
T	7 1 3 2 4 8 9 5 6 10 11
L	1 5 6 2 3 7 8 4 9 10 12 13 11
S	S1-1 S1-2 S1-11 S1-11 S1-7 S1-6 S1-12 S1-9 S2-5 S1-8 S2-2 S2-3 S2-6 S3-8 S7
	S1-5 S1-10 S3-1 S3-2 S1-4 S1-3 S3-6 S8 S3-3 S3-4 S4 S2-4 S3-5 S3-9 S3-7 S6

Notes:
1. $S_{1-1} \sim S_{1-9}$: Band Selector Switch in "FM" Position
2. $S_{2-1} \sim S_{2-9}$: Function Selector Switch in "PHONO" Position
3. $S_{3-1} \sim S_{3-9}$: Tape Selector Switch in "PLAYBACK" Position
4. S_4 : Phono motor ON-OFF Switch in "OFF" Position
5. S_5 : Tape motor ON-OFF Switch in "OFF" Position
6. S_6 : Power Source Switch in "OFF" Position
7. S_7 : Voltage Adjuster in "240V" Position
8. DC voltages are to be measured by means of vacuum tube voltmeter under no signal condition. Measured DC voltages should show negative polarity to ground.
9. Battery Current :

Phono motor	....	No load	40 mA
Tape motor	....		55 mA
Radio	....	No load	30 mA
		MAX Power	270 mA


B
NAME
E
C
TR₁ TR₂
TR₁₇ TR₁₉
Collector
Base
Emitter
TR3~TR5
TR
Collector
Base
Emittor
TR₁₀~TR₁₆
TR₁₈, TR₂₀
Collector
Base
Emittor
TR8

🟥 POSITIVE LINE
🟦 NEGATIVE LINE

CIRCUIT BOARD AND ALIGNMENT POINTS (RADIO)

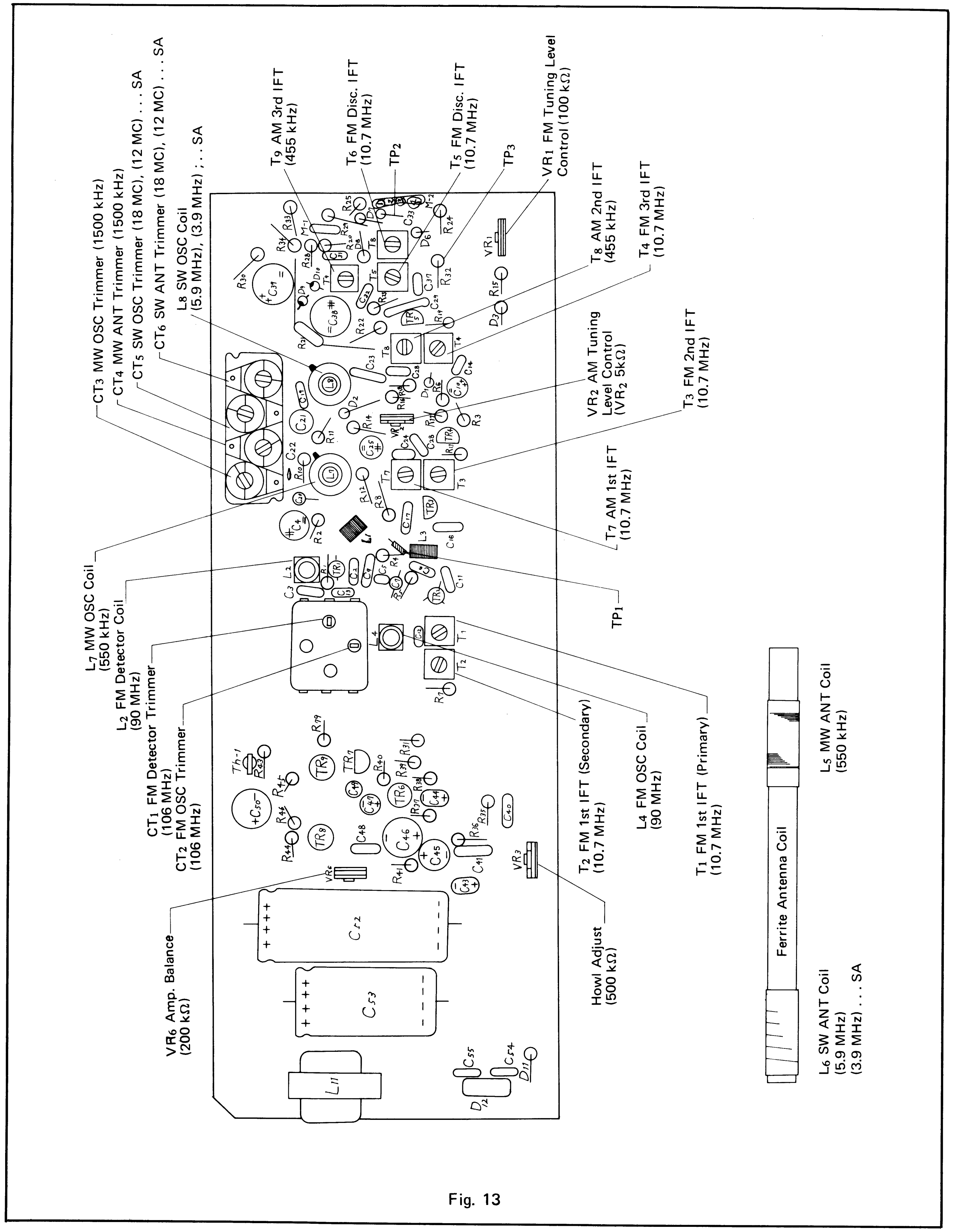

CT3 MW OSC Trimmer (1500 kHz)
CT4 MW ANT Trimmer (1500 kHz)
CT5 SW OSC Trimmer (18 MC), (12 MC) . . . SA
CT6 SW ANT Trimmer (18 MC), (12 MC) . . . SA
L8 SW OSC Coil (5.9 MHz), (3.9 MHz) ; . . SA
T9 AM 3rd IFT (455 kHz)
T6 FM Disc. IFT (10.7 MHz)
TP2
T5 FM Disc. IFT (10.7 MHz)
TP3
VR1 FM Tuning Level Control (100 kΩ)
T8 AM 2nd IFT (455 kHz)
T4 FM 3rd IFT (10.7 MHz)
VR2 AM Tuning Level Control (VR2 5kΩ)
T3 FM 2nd IFT (10.7 MHz)
T7 AM 1st IFT (10.7 MHz)
TP1
L7 MW OSC Coil (550 kHz)
L2 FM Detector Coil (90 MHz)
CT1 FM Detector Trimmer (106 MHz)
CT2 FM OSC Trimmer (106 MHz)
T2 FM 1st IFT (Secondary) (10.7 MHz)
L4 FM OSC Coil (90 MHz)
T1 FM 1st IFT (Primary) (10.7 MHz)
L5 MW ANT Coil (550 kHz)
Ferrite Antenna Coil
VR6 Amp. Balance (200 kΩ)
Howl Adjust (500 kΩ)
L6 SW ANT Coil (5.9 MHz) (3.9 MHz) . . . SA
L11
Cs2
Cs3
VR3
TP1

Fig. 13

CIRCUIT BOARD AND ALIGNMENT POINT (TAPE RECORDER)

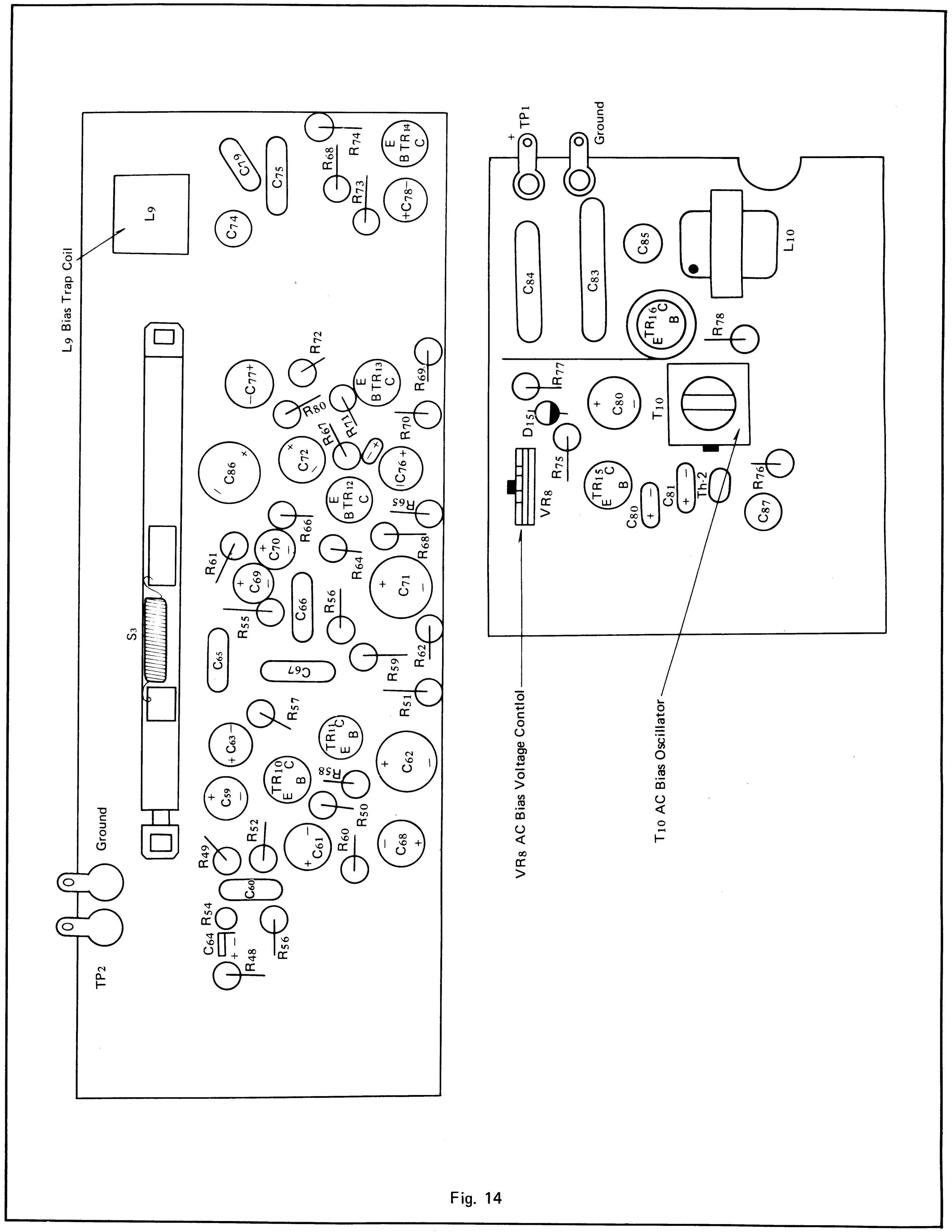

L9 Bias Trap Coil
L9
Ground
TP2
S3
TP1
Ground
L10
T10
VR8
VR8 AC Bias Voltage Contlol
T10 AC Bias Oscillator

Fig. 14

ALIGNMENT INSTRUCTIONS (RADIO)

FREQUENCY & DISTANCE ON DIAL

To accurately align the proper frequencies to the dial, refer to table and mark the edge of the dial accordingly using the "Start Point" mark on the dial as a reference point.

Table

Band	Frequency	Distance from "Start Point"
FM	90 MHz 106 MHz	18.6 mm 69.4 mm
MW	550 MHz 1500 kHz	9.8 mm 63.3 mm
SW	5.9 MHz 18 MHz	4 mm 89.2 mm
SW(SA)	3.9 MHz 12 MHz	4 mm 89.2 mm

IF & RF ALIGNMENT (Refer to Fig. 13)

Output of signal generator should be no higher than necessary to obtain an output reading.
Set function selector switch to RADIO.
Set band selector switch to MW and SW
Set volume control to maximum.
Set tone control to high.
Set power source voltage to 9 volts DC.

STEP	BAND	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1	MW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	455 kHz (400 ∿ Mod.)	Point of non-interference. (on/about 600 kHz)	Output meter across voice coil terminal.	T_7 (1st I.F.T) T_8 (2nd I.F.T) T_9 (3rd I.F.T)	Adjust for maximum output.
2	MW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	550 kHz (400 ∿ Mod.)	550 kHz	Output meter across voice coil terminal.	L_7 (OSC Coil) L_5 (ANT Coil)	Adjust for maximum output by sliding coil (L_5) along ferrite core.
3	MW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	1500 kHz (400 ∿ Mod.)	1500 kHz	Output meter across voice coil terminal.	CT_3 (OSC Trimmer) CT_4 (ANT Trimmer)	Adjust for maximum output. Repeat steps (2) and (3)
4	SW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	5.9 MHz 3.9 MHz (SA) (400 ∿ Mod.)	5.9 MHz 3.9 MHz (SA)	Output meter across voice coil terminal.	L_8 (OSC Coil) L_6 (ANT Coil)	Adjust for maximum output by sliding coil (L_6) along ferrite core.
5	SW	Fashion loop of several turns of wire and radiate signal into loop of receiver.	18 MHz 12 MHz (SA) (400 ∿ Mod.)	18 MHz 12 MHz (SA)	Output meter across voice coil terminal.	CT_5 (OSC Trimmer) CT_6 (ANT Trimmer)	Adjust for maximum output. Repeat steps (4) and (5).

Note: Cement anternna bobbin with wax after completing alignment.

ALIGNMENT INSTRUCTIONS (RADIO)

FM IF & DETECTOR ALIGNMENT WITH OSCILLOSCOPE (Refer to Fig. 13)

OSCILLOSCOPE

Set sweep selector of oscilloscope to "External Sweep". Apply 60 ∿ sweep signal from sweep generator to horizontal input terminals of oscilloscope.

EQUIPMENT REQUIRED

Signal generator that provides 10.7 MHz marker.
Sweep generator that provides 10.7 MHz center frequency and 400 kHz sweep width.
Set band selector switch to FM.
Set volume control to minimum.
Set tone control to high.
Set power source voltage to 9 volts DC.

Note: When aligning step 1, unsolder lead of test point TP3 before alignment and resolder it after alignment.

STEP	SWEEP GENERATOR COUPLING	SIGNAL GENERATOR COUPLING	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1	High side thru. .001 mfd to point TP_1 Common to chassis.	High side thru. .001 mfd to point TP_1 Common to chassis.	Point of non-interference. (on/about 98 MHz)	Connect vert. Amp. of scope to point TP_2 Common to chassis	T_1 (FM 1st IFT) T_2 (FM 1st IFT) T_3 (FM 2nd IFT) T_4 (FM 3rd IFT)	Adjust for maximum amplitude and proper linearity between 100 kHz markers. (Refer to Fig. 15)
2	High side thru. .001 mfd to point TP_1 Common to chassis.	High side thru. .001 mfd to point TP_1 Common to chassis.	Point of non-interference. (on/about 98 MHz)	Connect vert. Amp of scope to point TP_3 chassis.	T_5 (FM Disc. IFT) T_6 (FM Disc. IFT)	Adjust T_6 so that 10.7 MHz marker appears at the center. (Refer to Fig. 16)

Note; When aligning the Ratio Detector stage, the wave form may appear as in Figs. 15 & 16 or upside-down.

Fig. 15

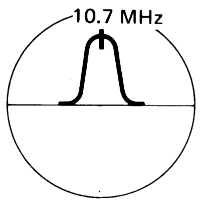


Fig. 16

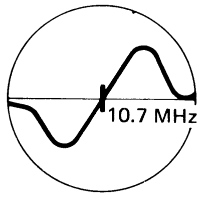
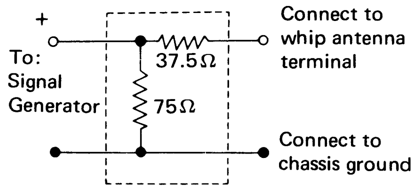


Fig. 17
DUMMY ANTENNA

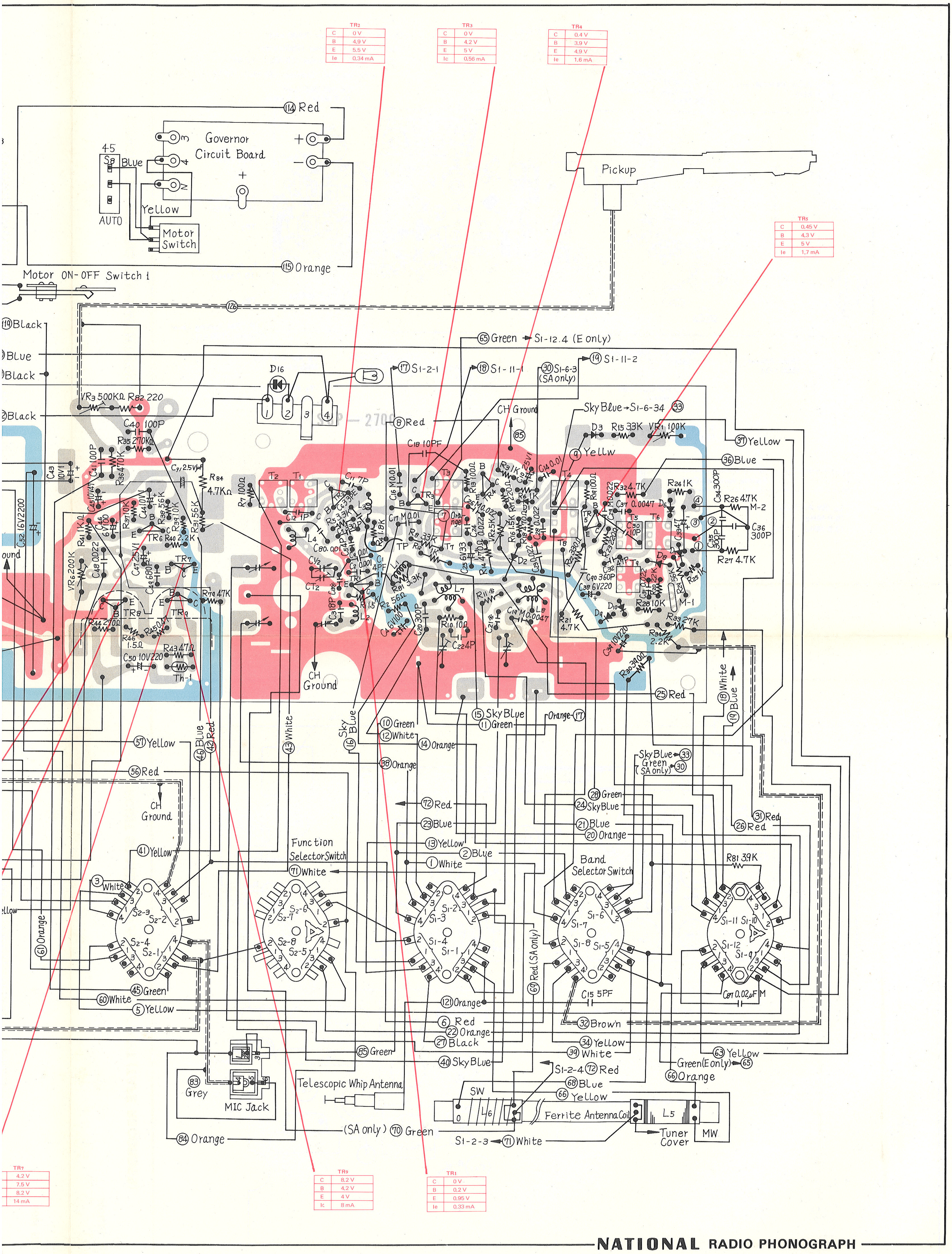


FM RF ALIGMENT (Refer to Fig. 13)

Output of signal generator should be no higher than necessary to obtain an output reading.
Set volume control to maximum.
Set band selector switch to FM.
Set tone control to High.
Set power source voltage to 9 volts DC.

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR COUPLING	RADIO DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
3	Connect to "FM" antenna terminal through dummy antenna. Common to chassis.	90 MHz (40 Mod.)	90 MHz	Output meter across voice coil terminal	L_4 (FM OSC Coil) L_2 (FM Detector Coil)	Adjust for maximum output.
4	Connect "FM" antenna terminal through dummy antenna. Common to chassis.	106 MHz (400 Mod.)	106 MHz	Output meter across voice coil terminal	CT_2 (FM OSC Trimmer) CT_1 (FM Detector Trimmer)	Adjust for maximum output. Repeat steps. (3) and (4)

Note: As three output respones will be present, proper tuning is the center frequency.



Governor
Circuit Board
Pickup
Motor Switch
Motor ON-OFF Switch 1
AUTO
45
S8
Blue
Yellow
⑭ Red
⑮ Orange
126
⑲ Black
Blue
Black
Black
D16
⑥⑤ Green → S1-12.4 (E only)
⑰ S1-2-1
⑱ S1-11-1
㉚ S1-6-3 (SA only)
⑲ S1-11-2
CH Ground
Sky Blue → S1-6-34 ㉝
D3 R15 33K VR1 100K
⑨ Yellw
㊲ Yellow
㊱ Blue
⑧ Red
VR3 500KΩ R82 220
C40 100P
R35 270KΩ
C41 100P
R36 470K
C43 10V1
C7 2.5V
R84 4.7KΩ
R7 100Ω
C18 10P
C11 7P
C16 M0.01
C17 M0.01
C12 1P
T2 T1 T3 T4 T5 T6 T7 T8
TR1 TR2 TR3 TR4 TR5 TR6 TR7 TR8 TR9
R26 4.7K
M-2
C36 300P
C34 300P
C35 300P
R27 4.7K
R24 1K
R32 4.7K
C37 0.0047
C40 360P
C38 6V220
R28 10K
M-1
R33 27K
R34 2.2K
R30 390Ω
C39 10V220
R21 4.7K
C14 0.01
C19 M0.0047
C22 4P
R10 10Ω
C20 300P
C6 16V100
L2 L3 L4 L5 L6 L7 L8
CT2
C80 0.001
TP
R8 33K
C52 16V200
VR2 200K
C48 0.022
C47 25V1
C49 680P
R41 1K
C45 10V47
C46 6V100
C44 10V1
R37 10K
R38 5.6K
R39 10K
R40 2.2K
R31 56K
R74 47K
R44 270Ω
R45 0.47
R46 1.5Ω
R43 47Ω
C50 10V220
Th-1
CH Ground
㉕ Red
⑱ White
⑲ Blue
⑮ Sky Blue
⑪ Green
Orange ⑰
⑩ Green
⑫ White
⑭ Orange
㊳ Orange
⑯ Sky Blue
㊸ White
㊻ Blue
㊷ Red
㊼ Yellow
㊺ Red
CH Ground
Sky Blue ㉝
Green (SA only) ㉚
㉘ Green
㉔ Sky Blue
㉑ Blue
⑳ Orange
㉛ Red
㉖ Red
⑦② Red
㉓ Blue
⑬ Yellow
② Blue
① White
Function Selector Switch
⑦① White
Band Selector Switch
R81 39K
④① Yellow
③ White
S2-3 S2-2 S2-4 S2-1 S2-6 S2-7 S2-8 S2-5
S1-2 S1-3 S1-4 S1-1 S1-6 S1-7 S1-8 S1-5 S1-11 S1-10 S1-12 S1-9
⑥① Orange
Yellow
⑥⑨ Red (SA only)
④⑤ Green
⑥⓪ White
⑤ Yellow
⑫① Orange
C15 5PF
㉜ Brown
C87 0.02μF M
⑥ Red
㉒ Orange
㉗ Black
㉞ Yellow
㊴ White
⑥③ Yellow
Green (E only) ⑥⑤
⑥⑥ Orange
⑧⑤ Green
④⓪ Sky Blue
S1-2-4 ⑦② Red
⑥⑧ Blue
⑥⑥ Yellow
⑧③ Grey
MIC Jack
Telescopic Whip Antenna
SW
Ferrite Antenna Coil
L5 L6
Tuner Cover
MW
(SA only) ⑦⓪ Green
⑧④ Orange
S1-2-3 ⑦① White
SUP-2700

TR2

C	0 V
B	4.9 V
E	5.5 V
Ie	0.34 mA

TR3

C	0 V
B	4.2 V
E	5 V
Ic	0.56 mA

TR4

C	0.4 V
B	3.9 V
E	4.9 V
Ie	1.6 mA

TR5

C	0.45 V
B	4.3 V
E	5 V
Ie	1.7 mA

TR7

	4.2 V
	7.5 V
	8.2 V
	14 mA

TR9

C	8.2 V
B	4.2 V
E	4 V
Ic	8 mA

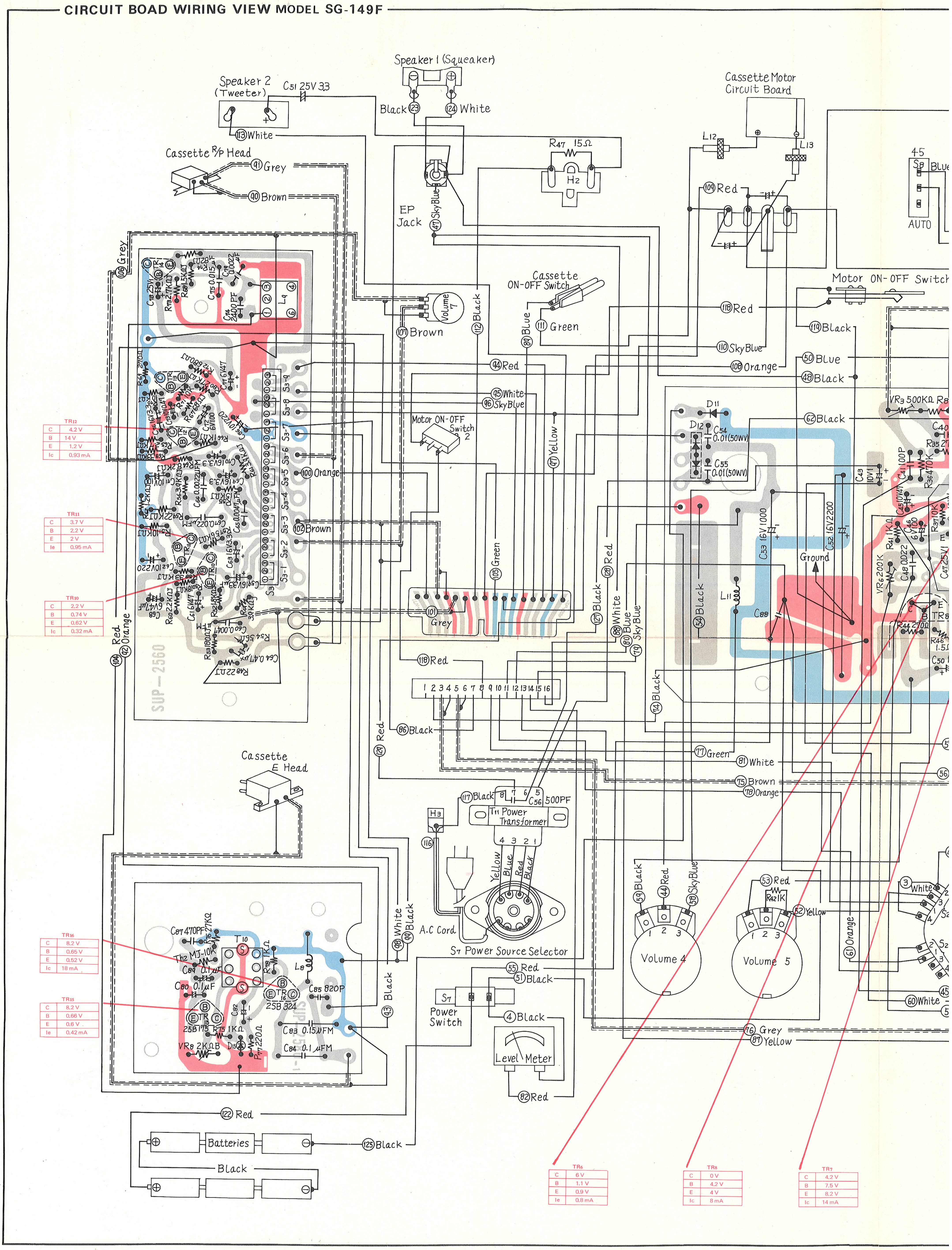
TR1

C	0 V
B	0.2 V
E	0.95 V
Ie	0.33 mA

NATIONAL RADIO PHONOGRAPH

PRINTED IN JAPAN

CIRCUIT BOAD WIRING VIEW MODEL SG-149F


Speaker 1 (Squeaker)
Speaker 2 (Tweeter)
C51 25V 33
Black ㉓
㉔ White
113 White
Cassette Motor Circuit Board
L12
L13
R47 15Ω
H2
Cassette P/P Head
91 Grey
90 Brown
EP Jack
47 SkyBlue
109 Red
45
S8
Blue
AUTO
106 Grey
Volume
107 Brown
112 Black
Cassette ON-OFF Switch
89 Blue
111 Green
118 Red
Motor ON-OFF Switch
119 Black
110 SkyBlue
108 Orange
50 Blue
48 Black
94 Red
95 White
96 SkyBlue
Motor ON-OFF Switch 2
97 Yellow
100 Orange
102 Brown
S3-1 S3-2 S3-3 S3-4 S3-5 S3-6 S3-7 S3-8 S3-9
S3
D11
D12
C54 0.01(50WV)
C55 0.01(50WV)
62 Black
VR3 500KΩ
C43 10V1
C53 16V 1000
C52 16V 2200
Ground
L11
C88
54 Black
105 Green
101 Grey
128 Red
127 Black
88 White
80 Blue
79 Sky Blue
74 Black
104 Red
92 Orange
SUP-2560
116 Red
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
86 Black
129 Red
77 Green
81 White
75 Brown
78 Orange
Cassette E Head
117 Black
C56 500PF
T11 Power Transformer
H3
116
4 3 2 1
Yellow Blue Red Black
A.C Cord
S7 Power Source Selector
98 White
99 Black
93 Black
59 Black
44 Red
58 SkyBlue
53 Red
R42 1K
52 Yellow
Volume 4
Volume 5
61 Orange
3 White
55 Red
51 Black
S7 Power Switch
4 Black
Level Meter
82 Red
76 Grey
87 Yellow
60 White
C87 470PF
R76 27KΩ
T10
Thz MJ-101
C89 0.1μF
C80 0.1μF
TR16 2SB324
C85 820P
L8
TR15 2SB175
R75 1KΩ
VR8 2KΩB
C83 0.15μFM
C84 0.1μFM
122 Red
Batteries
125 Black
Black

TR12

C	4.2 V
B	14 V
E	1.2 V
Ic	0.93 mA

TR11

C	3.7 V
B	2.2 V
E	2 V
Ie	0.95 mA

TR10

C	2.2 V
B	0.74 V
E	0.62 V
Ic	0.32 mA

TR16

C	8.2 V
B	0.65 V
E	0.52 V
Ic	18 mA

TR15

C	8.2 V
B	0.66 V
E	0.6 V
Ie	0.42 mA

TR6

C	6 V
B	1.1 V
E	0.9 V
Ie	0.8 mA

TR8

C	0 V
B	4.2 V
E	4 V
Ic	8 mA

TR7

C	4.2 V
B	7.5 V
E	8.2 V
Ic	14 mA

NOTES

ADJUSTMENT OF LEVEL METER (Refer to Fig.13)

SELECTOR SWITCH POSITION	ADJUST	REMARKS
PH ↓ FM ↓ MW	VR_1 (100kΩ) VR_2 (5kΩ)	1. Set power source voltage to 9 volts DC. 2. Set function selector switch to PH and turn to FM, MW (SW_1 & SW_2). 3. No-signal condition. 4. Adjust VR_1 (100kΩ) at FM position so that the pointer of the level meter points same position as shown at PH. 5. Adjust VR_2 (5kΩ) at MW so that the pointer of the level meter points to same position as shown at PH.

Note: Short No. 13 pin of 16 pin circuit board connector and position No. 14 pin before alignment.

Battery Check

Level meter shows when batteries have to be replaced. Set function selector switch to PH. If pointer of level meter is seen in the red area, set will operate normally. When pointer is seen in the other area, batteries must be replaced.

Tuning

Level meter may be used for correct tuning in MW, SW and FM reception. Pointer moves to left when station is correctly tuned in.

Maximum swing shows correct tuning.

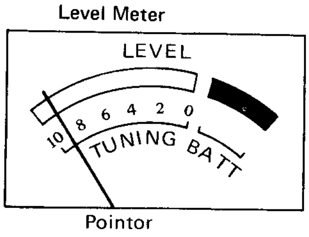
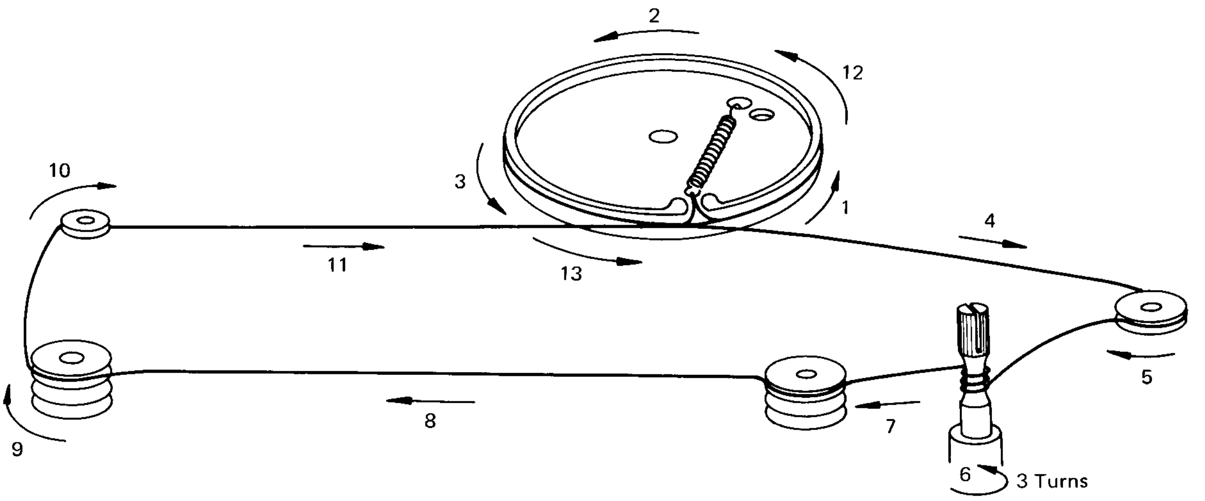


Fig. 18

DIAL CORD STRINGING GUIDE



Notes:

1. Tuning capacitor should be positioned at maximum capacity.
2. Numbered arrows (1-13) indicate correct order of stringing dial cord.
3. Cement dial cord ends.

To Mount Dial Pointer

1. Set tuning capacitor to fully closed position.
2. Set dial pointer to starting point.
3. Attach dial cord to dial pointer.

Fig. 19

ALIGNMENT INSTRUCTIONS (TAPE RECORDER)

CONTROL SETTING & PROCEDURE

- Set function selector switch to TAPE.
- Set push button to PLAY and REC at the same time.
- Set power source switch to ON.
- Set power source voltage to 9 volts DC.

(Refer to Fig. 14)

STEP	CIRCUITS	VTVM CONNECTION	RECORD LEVEL CONTROL	ADJUSTMENT	REMARKS
1	AC BIAS OSCILLATOR & ERASE	Connect positive side to test point and negative side to TP_1. (Refer to $VTVM_1$ in Fig. 17)	MIN	T_4 (AC Bias Oscillator) VR_6 (AC Bias Voltage Control)	Adjust T_4 for maximum indication of $VTVM_1$ Adjust VR_6 for 8V of $VTVM_1$ reading.
2	AC BIAS OSCILLATOR & ERASE	Connect positive side to test point and negative side to $VTVM_2$ to TP_2.	MIN	L_7 (Bias Trap Coil)	Adjust L_7 for 28.6 mV of $VTVM_2$ reading.

RECOMMENDED EQUIPMENT CONNECTIONS

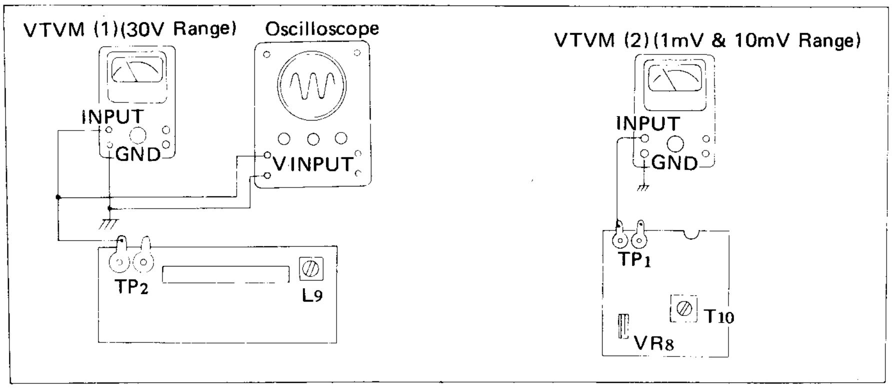

VTVM (1)(30V Range)
Oscilloscope
INPUT
GND
V INPUT
TP_2
L_9
VTVM (2)(1mV & 10mV Range)
INPUT
GND
TP_1
T_{10}
VR_8

Fig. 20

RECORD/PLAYBACK HEAD AZIMUTH ADJUSTMENT

Playback Standard Alignment Tape and turn head adjustment screw so that high range of speaker sound is expanded.

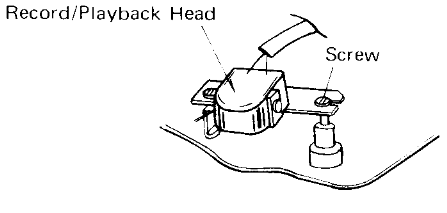

Record/Playback Head
Screw

Fig. 21

MECHAICAL ADJUSTMENT - TAPE RECORDER

PINCH ROLLER ADJUSTMENT (Refer to Fig. 22)

1. Switch set to PLAY mode.
2. Suspend spring gauge hold it in direction of arrow.
3. Measure value when pinch roller is detached from capstan.
4. The standard pressure of pinch roller is 350±50 g.
5. If pressure is beyond limits, replace pinch roller spring.

TAKEUP TORQUE ADJUSTMENT

Takeup Torque Measurement with Torque Meter (Refer to **Fig. 23**)

Equipment Required:

- Torque Meter (having a range of 20 ~ 100 g/cm)
- Attachment (Take out reel of cassette tape, make 2 holes through its frame, and attach it to the torque meter with wire.)

1. Switch set to PLAY mode and put attachment with the torque meter onto takeup reel.
2. The standard takeup tension of the takeup reel is 55 ± 20 g cm.

Takeup Torque Measurement with Tension Gauge (Refer to **Fig. 24**)

Equipment Required:

- Tension Gauge
- Attachment

1. Switch set to PLAY mode.
2. Put attachment which is connected to tension gauge by cord (about 30 cm) onto the takeup reel.
3. To read the number of the tension gauge, move the gauge in direction of arrow without slackening the cord.
4. The standard takeup tension of the takeup reel is 55 ± 20 g cm.

If the takeup tension is beyond these limits-

(a) • remove oil and dust to flywheel belt (52) and/or
(b) • remove oil and stuck to the rubber part of the take-up reel and/or
(c) • replace takeup lever spring (73) (Refer to **Fig. 25**) and/or
(d) • remove rust from pinch roller or replace with new one.

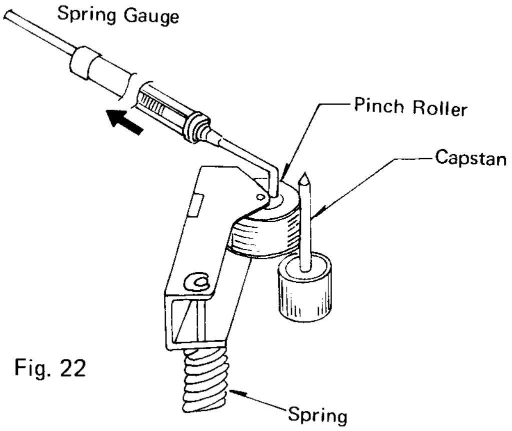


Fig. 22

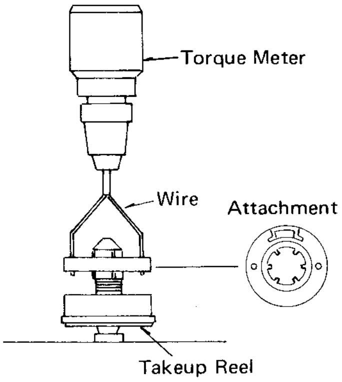


Fig. 23

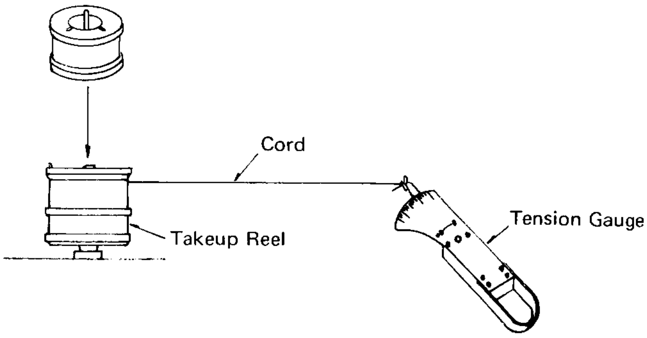


Fig. 24

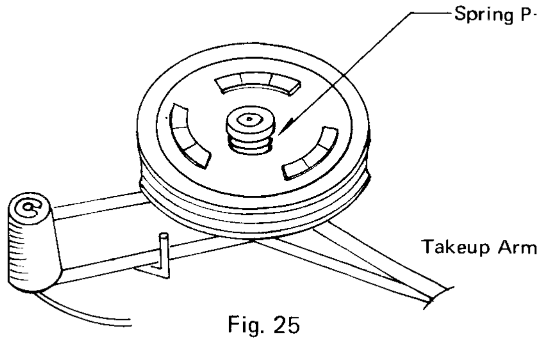


Fig. 25

TAPE TRANSPORT OPERATIONS

PLAYBACK (Refer to Fig. 26)

When play button is pushed, play button lever (4) moves brake operating lever (57). The brake arm (30) to stop both reel is then released.

At this time, brake operating lever brings one spring plate of rest switch into contact with the other, and rest switch is ON.

The set is then in the playback mode. Motor revolutions are transmitted to the flywheel (50) by the belt (52). When takeup arm (68) moves, takeup idler (72) contacts to takeup reel. The takeup reel (34) begins to takeup tape by means of rotation of the takeup arm (68).

At the same time, pinch roller (18) contacts with to capstan in order to start the tape moving.

The playback/record and erase heads (21) contact the surface of the cassette tape. The unit remains in playback mode.

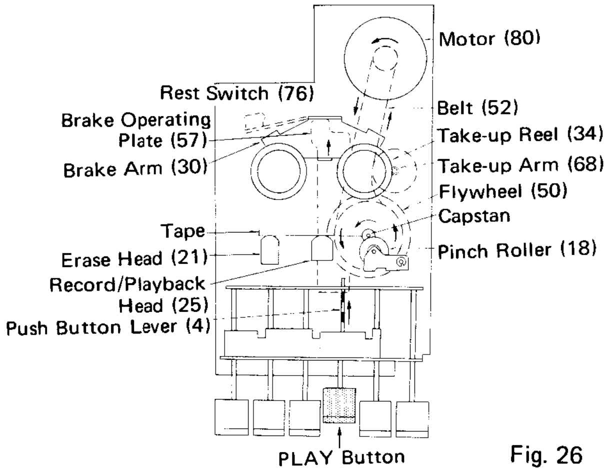

Motor (80)
Rest Switch (76)
Brake Operating Plate (57)
Brake Arm (30)
Belt (52)
Take-up Reel (34)
Take-up Arm (68)
Flywheel (50)
Capstan
Tape
Erase Head (21)
Pinch Roller (18)
Record/Playback Head (25)
Push Button Lever (4)
PLAY Button

Fig. 26

FAST FORWARD (Refer to Fig. 28)

When FF button is pushed, FF button lever (4) moves FF operating plate (60). Then FF idler arm (58) contacts with flywheel. The rotation of the flywheel is transmitted to FF idler because FF idler has made contact with flywheel and takeup reel. During FF button is pushed, these function.

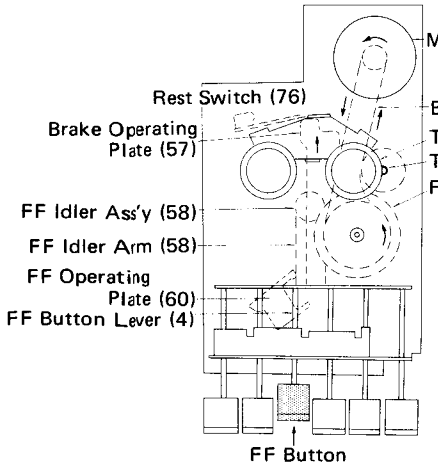

Motor (80)
Rest Switch (76)
Brake Operating Plate (57)
Belt (52)
Take-up Reel (34)
Take-up Arm (68)
Flywheel (50)
FF Idler Ass'y (58)
FF Idler Arm (58)
FF Operating Plate (60)
FF Button Lever (4)
FF Button

Fig. 28

RECORD (Refer to Fig. 27)

When record and play button are pushed at the same time, play button lever moves brake operating lever.

At this time, brake operating lever brings one spring plate of rest switch into contact with the other, and rest switch ON. REC button lever (4) pushes to the recording position Playback- REC Selector Switch, Operation of the unit is the same as for playback.

Note:

If the tab of cassette tape is removed, record button will not function. In order to record, paper or similar material must be used to make the tab function.

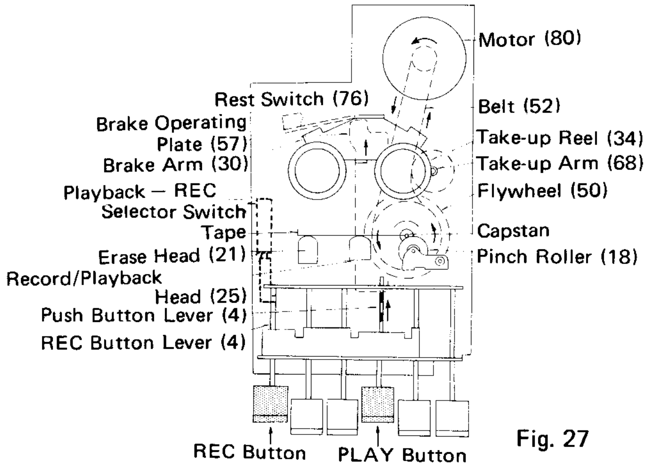

Motor (80)
Rest Switch (76)
Brake Operating Plate (57)
Brake Arm (30)
Belt (52)
Take-up Reel (34)
Take-up Arm (68)
Flywheel (50)
Playback – REC Selector Switch
Tape
Capstan
Erase Head (21)
Pinch Roller (18)
Record/Playback Head (25)
Push Button Lever (4)
REC Button Lever (4)
REC Button
PLAY Button

Fig. 27

REWIND (Refer to Fig. 29)

When REW button is pushed, REW arm (62) is pulled to forward (direction of arrow) by spring (63). REW idler (62) contacts with FF idler and supply reel (34).

At the same time, FF idler contacts with flywheel and REW idler.

The rotation of the flywheel is transmitted to REW idler and FF idler.During REW button is pushed, these function.

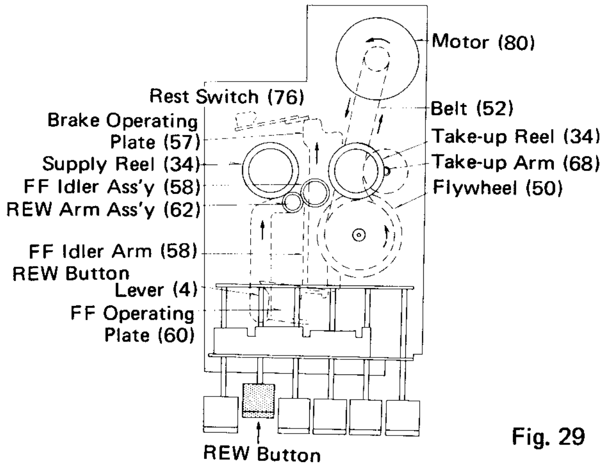

Motor (80)
Rest Switch (76)
Brake Operating Plate (57)
Supply Reel (34)
FF Idler Ass'y (58)
REW Arm Ass'y (62)
Belt (52)
Take-up Reel (34)
Take-up Arm (68)
Flywheel (50)
FF Idler Arm (58)
REW Button Lever (4)
FF Operating Plate (60)
REW Button

Fig. 29

PARTS IDENTIFICATION - TAPE DECK

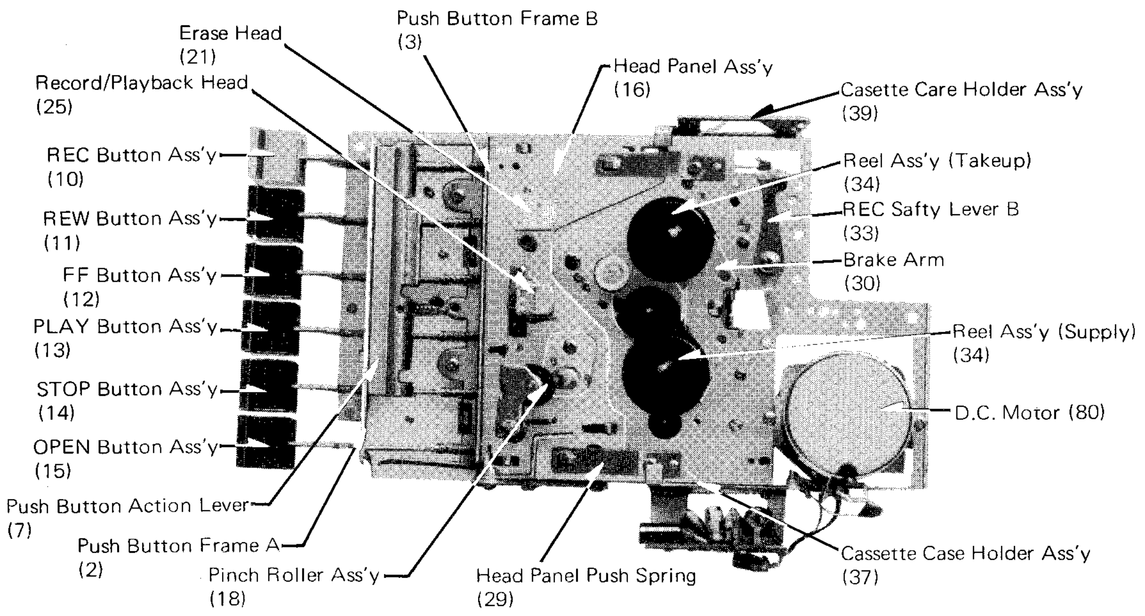

Erase Head (21)
Push Button Frame B (3)
Record/Playback Head (25)
Head Panel Ass'y (16)
Casette Care Holder Ass'y (39)
REC Button Ass'y (10)
Reel Ass'y (Takeup) (34)
REW Button Ass'y (11)
REC Safty Lever B (33)
FF Button Ass'y (12)
Brake Arm (30)
PLAY Button Ass'y (13)
Reel Ass'y (Supply) (34)
STOP Button Ass'y (14)
D.C. Motor (80)
OPEN Button Ass'y (15)
Push Button Action Lever (7)
Push Button Frame A (2)
Pinch Roller Ass'y (18)
Head Panel Push Spring (29)
Cassette Case Holder Ass'y (37)

Fig. 30 TOP VIEW

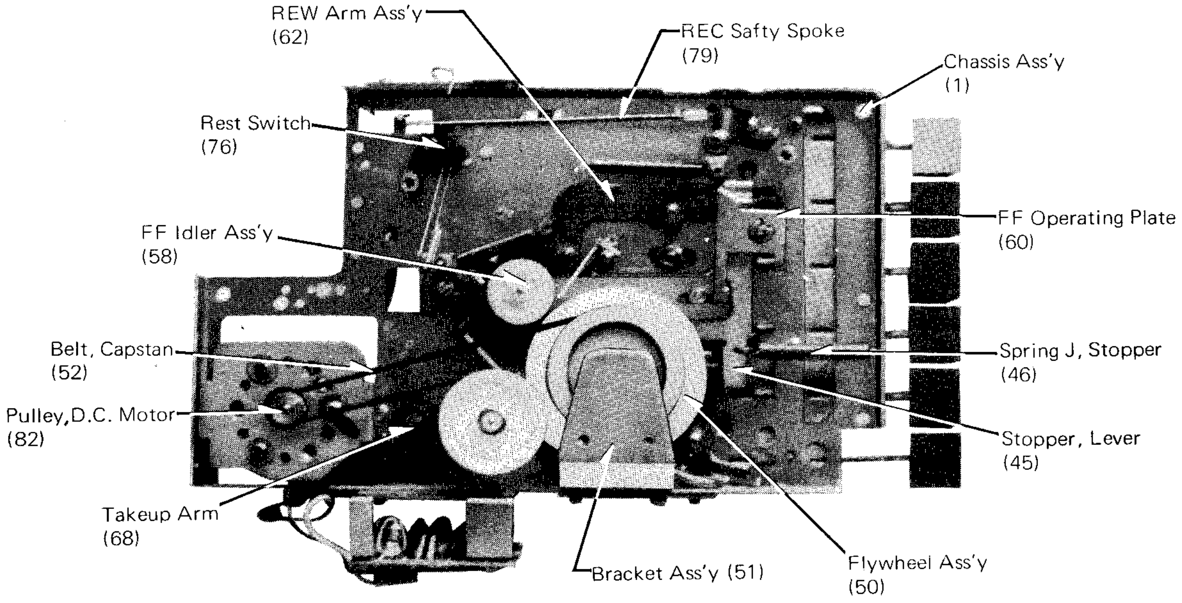

REW Arm Ass'y (62)
REC Safty Spoke (79)
Chassis Ass'y (1)
Rest Switch (76)
FF Idler Ass'y (58)
FF Operating Plate (60)
Belt, Capstan (52)
Spring J, Stopper (46)
Pulley,D.C. Motor (82)
Stopper, Lever (45)
Takeup Arm (68)
Bracket Ass'y (51)
Flywheel Ass'y (50)

Fig. 31 BOTTOM VIEW

EXPLODED VIEW OF CASSETTE DECK

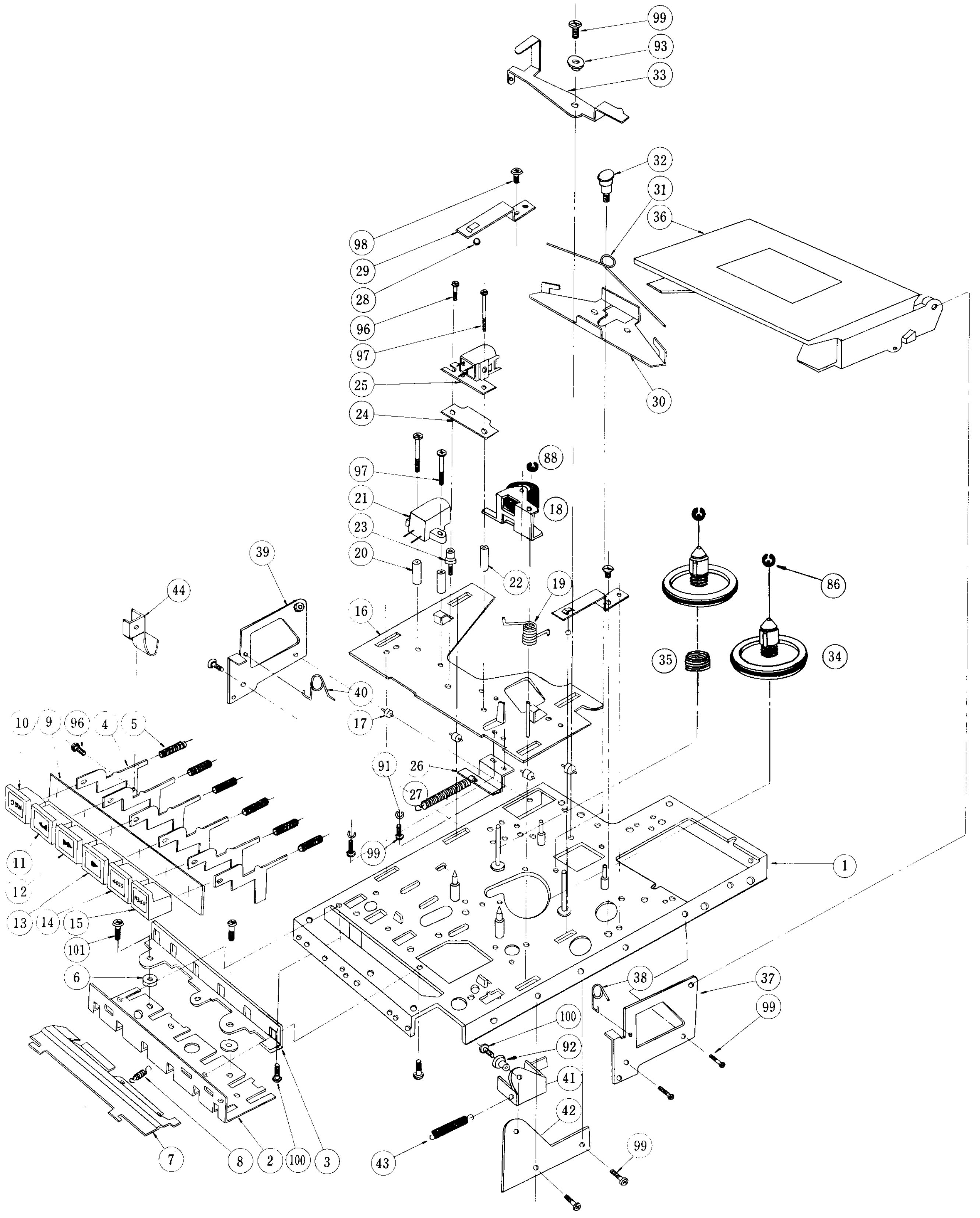

99
93
33
32
31
36
98
29
28
96
97
25
30
24
97
88
21
18
23
20
22
19
86
39
44
16
35
34
40
17
10
9
96
4
5
91
26
27
99
1
11
12
13
14
15
101
6
38
37
99
100
92
41
42
7
8
2
100
3
43
99

Fig. 32 TOP VIEW

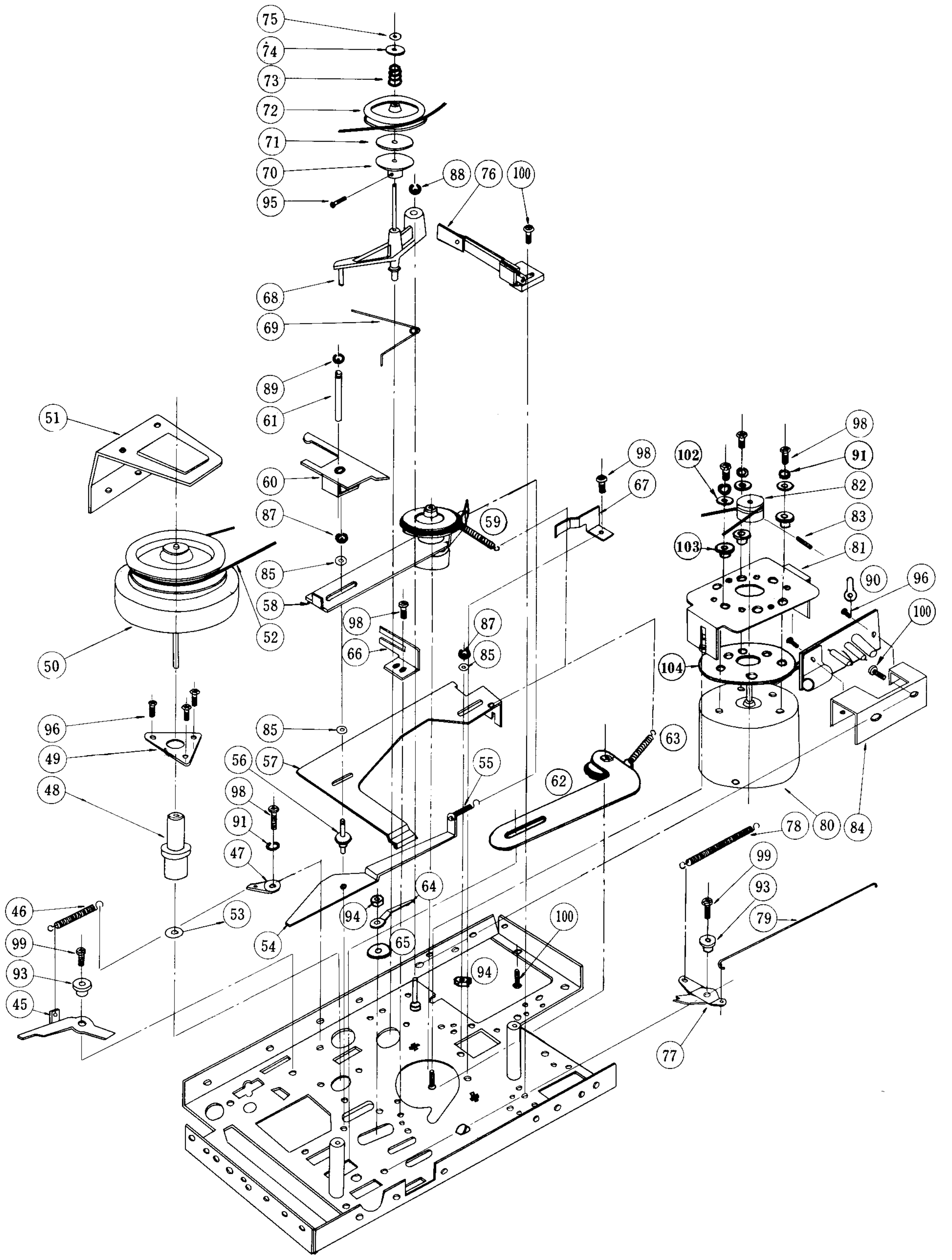

75
74
73
72
71
70
88
76
100
95
68
69
89
61
51
60
87
59
98
67
102
98
91
82
83
103
81
85
58
90
96
100
52
98
87
66
85
104
50
96
85
49
63
56
57
55
48
62
98
91
78
80
84
47
64
99
93
46
53
94
65
79
99
100
54
94
93
45
77

Fig. 33 BOTTOM VIEW

TAPE RECORDER CIRCUITS

1. Recording Circuits

Signal for recording is selected by select switch S_1-8, S_2-2 & S_2-1 and applied to Pre-Amplifier TR_{10}. The recording signal, amplified by TR_{12} & TR_{13}, passes C_{77}, R_{68}, L_9, and C_{74}, to reach recording head, and is finally recorded on the magnetic tape. R_{48} is used to keep the current in the head constant and to compensate the high frequency range.

As Fig. 34 shows, impedance of the head increases in proportion to the frequency. In order to keep the current in the head constant, output impedance R should either be greatly increased or, if it is low, the signal voltage applied to the head should be increased in proportion to the frequency. R_{68} is used for this purpose. L_9 & C_{74} are resonated to recording (or erasing) bias frequency. L_9, C_{75} & C_{74} are used to prevent leakage of recording bias current to AF circuits, and to adjust recording bias current.

where : Z=Impedance of Head
V=Voltage of Head
i =Current of Head

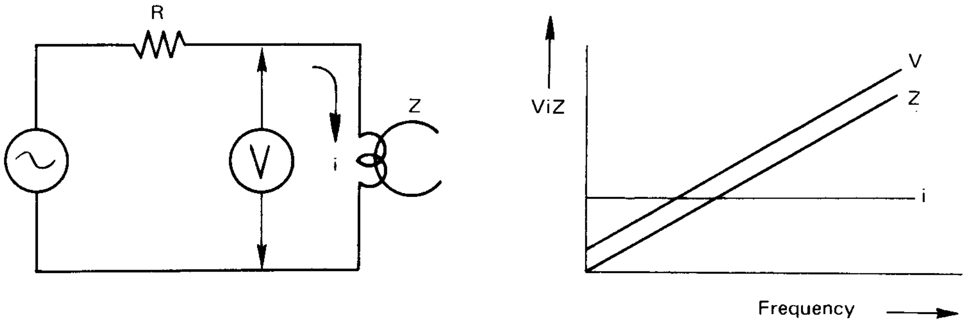

R
V
i
Z
ViZ
V
Z
i
Frequency

Fig. 34

2. Playback Circuits

The audio signal picked up by the playback head is applied to the audio Pre-Amplifier TR_{10}.

Frequency characteristics of the audio signal (which was picked up by the playback head) are boosted in the high frequency range and, therefore, the audio signal needs to be leveled by Equalizer Amplifiers TR_8, TR_{11}, TR_{12}, and TR_{13} to obtain a flat frequency response.

In the Equalizer Amplifier stages, NFB (negative feedback) circuits, consisting of C_{66}, C_{67}, R_{56}, R_{57} are employed to obtain the required equalizing characteristics. The audio signal (with flat frequency response) enters the AF Amplifiers from the Equalizer Amplifiers.

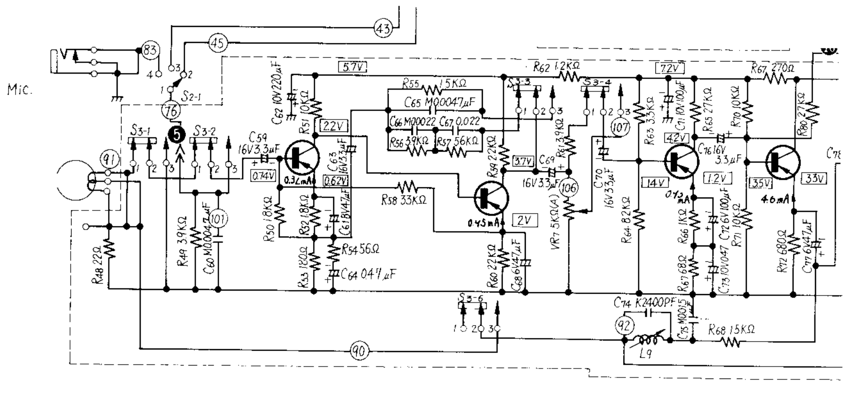

Mic.
83
45
43
76
S2-1
S3-1
S3-2
5
91
C59 16V3.3μF
R51 10KΩ
C62 10V220μF
5.7V
2.2V
0.74V
0.62V
R55 15KΩ
C65 M0.0047μF
C66 M0.0022
C67 0.022
R56 39KΩ
R57 56KΩ
R58 33KΩ
R54 56Ω
C64 0.47μF
R50 18KΩ
R52 18KΩ
R53 120Ω
R49 3.9KΩ
C60 M0.0047μF
101
R48 22Ω
3.7V
2V
R62 12KΩ
S3-3
S3-4
S3-5
S3-6
7.2V
R67 270Ω
107
106
R60 22KΩ
VR7 5KΩ
C70 16V33μF
R64 8.2KΩ
R65 33KΩ
C71 10V100μF
4.2V
1.4V
1.2V
3.5V
3.5V
R69 10KΩ
R70 27KΩ
C76 16V 3.3μF
R66 1KΩ
C72 16V100μF
R71 10KΩ
R72 680Ω
C73 0.0047
C74 K2400PF
C75 M0.015
92
R68 15KΩ
L9
90

Fig. 35

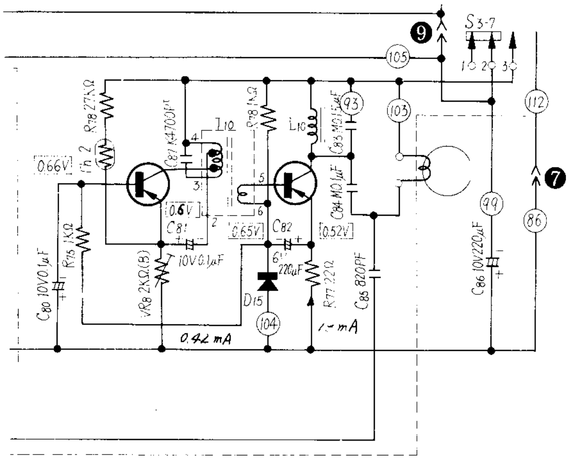
TAPE RECORDER CIRCUITS

3. AC Bias Oscillator and Erasing Circuits (Refer to Fig. 36)

By employing an AC erasing system, erasing and recording can be accomplished with little distortion or noise.

The AC erasing current required for the erasing head is approximately 130 mA (at both ends of head). If the waveform of the erasing current is distorted, harmonics of the oscillator frequency (about 35 kHz) are radiated by the erasing head winding and picked up by AM ferrite core antenna. These harmonics cause "beat" interference while recording AM broadcasting signals. The tank circuit, which is turned to 35 kHz, is the collector load TR_{16}, and consists of C_{83}, C_{84}, and inductance of erasing head, and TR_{16} applies sufficient erasing current to the erasing head with little distortion. An increase of distortion is caused by changes of temperature and line voltage. To prevent deterioration of frequency characteristics, recording level and erasing, a thermistor (TH_2 MT-10K) is employed in the Bias Oscillator stage TR_{13} and a diode(D_{15} 1S1121)in the Bias Power Amplifier stage TR_{16}.

In addition, a portion of the erasing bias current is applied to the recording head through capacitor C_{85}.



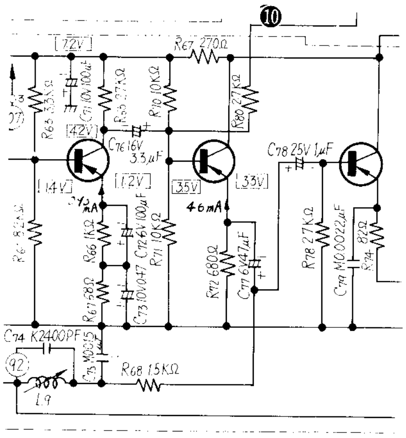
9
S3-7
1 2 3
105
112
7
R78 27KΩ
Th 2
0.66V
C87 K4700PF
L10
4
3
0.6V
C81
10V 0.1μF
2
R78 1KΩ
L10
5
6
0.65V
C82
6V 220μF
93
C83 M0.15μF
C84 M0.1μF
103
0.52V
R77 22Ω
C85 820PF
99
86
C86 10V 220μF
C80 10V 0.1μF
R75 1KΩ
VR8 2KΩ(B)
D15
104
0.42 mA
1.-mA

Fig. 36

4. Recording Indicator Circuit (Refer to Fig. 37)

When function selector switch (S_2-1 ~ S_2-6) is set to TAPE, and the REC button pushed, a portion of the recording signals, taken from Equalizer Amplifiers (TR_{12} & TR_{13}) through capacitor (C_{78}).

A portion of the recording signals is applied to level meter through TR_{14}.



10
7.2V
R67 270Ω
R63 33KΩ
C71 10V 100μF
R65 27KΩ
R70 10KΩ
R80 27KΩ
42V
C76 16V 3.3μF
C78 25V 1μF
14V
1.2V
35V
33V
46mA
R66 1KΩ
C72 6V 100μF
R71 10KΩ
R67 68Ω
C73 10V 0.47
R72 680Ω
C77 6V 47μF
R78 27KΩ
C79 M0.0022μF
R74 82Ω
C74 K2400PF
C75 M0.015μF
92
R68 1.5KΩ
L9

Fig. 37

REPLACING CARTRIDGE AND STYLUS

REPLACING STYLUS (Refer to Fig. 38, 39 and 40)

1. Lift pickup arm to a position that will make stylus accessible.
2. Loosen holding screw and gently remove stylus. (Fig. 38-a)
   USE SCREWDRIVER OF CORRECT SIZE.
3. Place the new stylus into position. Be sure stylus lever fits properly into armature. (Figs. 38-b & 38-c)
4. Tighten holding screw no more than is necessary to keep it from shaking loose.

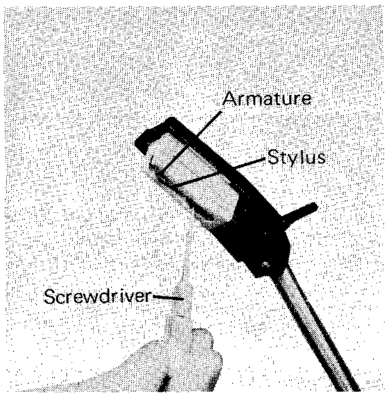

Armature
Stylus
Screwdriver

Fig. 38

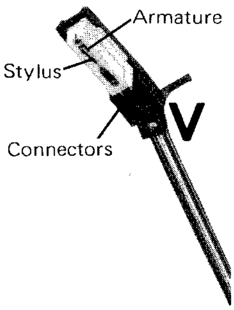

Armature
Stylus
Connectors
V

Fig. 39

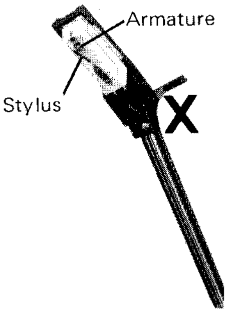

Armature
Stylus
X

Fig. 40

REPLACING CARTRIDGE (Refer to Fig. 41)

1. Lift pickup arm to a position that will make cartridge accessible.
2. Gently pull cartridge straight down.
3. Disconnect two (2) connectors from cartridge terminals.
4. To install a new cartridge, reverse the above procedure.

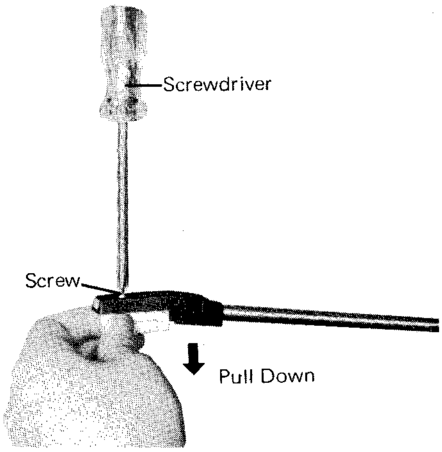

Screwdriver
Screw
Pull Down

Fig. 41

REPLACEMENT PARTS LIST

Note: ISO metric thread screws & parts which employ ISO metric thread screws are marked: ISO.

REF. No.	PART No.	DESCRIPTION	PER SET (pcs)	REMARKS
		TRANSISTORS AND DIODES		
TR$_{1}$	2SC921	FM RF Amplifier	1	
TR$_{2}$	2SC920	FM Converter	1	
TR$_{3}$	2SC829	FM 1st IF Amp. & AM Converter	1	
TR$_{4}$	2SC829	FM 2nd IF Amp. & AM 1st IF Amp.	1	
TR$_{5}$	2SC829	FM 3rd IF Amp. & AM 2nd IF Amp.	1	
TR$_{6}$	2SB346	1st AF Amplifier	1	
TR$_{7}$	2SB346	2nd AF Amplifier	1	
TR$_{8}$	2SD72	Power Output } pair	1	
TR$_{9}$	2SB405	Power Output	1	
TR$_{10}$	2SB346	Equalizer Pre-amp.	1	
TR$_{11}$	2SB175	Equalizer Pre-amp.	1	
TR$_{12}$	2SB175	Equalizer Amplifier	1	
TR$_{13}$	2SB175	Equalizer Amplifier	1	
TR$_{14}$	2SB175	Level Meter Amplifier	1	
TR$_{15}$	2SB175	AC Bias Oscillator	1	
TR$_{16}$	2SB324	AC Bias Power Amplifier	1	
D$_{1}$	0A90	FM Foward AGC	1	
D$_{2}$	0A90	AM D. AGC	1	
D$_{3}$	0A90	FM Meter Detector	1	
D$_{6}$	0A90	FM Discriminator } pair	1	
D$_{7}$	0A90	FM Discriminator	1	
D$_{8}$	0A90	AM Detector	1	
D$_{9}$	1S1211	AOC	1	
D$_{10}$	1S1211	AOC	1	
D$_{11}$	10D-1	AC/Battery Switching	1	
D$_{12}$	10DC-1R	Rectifier	1	
D$_{15}$	1S1211	AOC	1	
D$_{16}$	10D-1	AC Lamp Switching	1	
		THERMISTORS		
TH$_{1}$	ERT-D3FFK350S	Temperature Compensator	1	
TH$_{2}$	MT-10K	Temperature Compensator	1	
		INDICATOR		
	SSM-2	Level Meter	1	

REPLACEMENT PARTS LIST (Cont'd)

REF. No.	PART No.	DESCRIPTION	PER SET (pcs)	REMARKS
COILS AND TRANSFORMERS				
L1	ELQ-5A9	FM Antenna Coil	1	
L2	ELD-5N302	FM Det. Coil	1	
L3	ELQ-5AQ	IF Trap Coil	1	
L4	SLO-5N2	FM Oscillator Coil . . . SA	1	New
	ELL-5N305	FM Oscillator Coil	1	
L5 & L6	SLF-5F10	Ferrite Antenna Coil (MW & SW) . . . SA	1	New
	SLF-5F12	Ferrite Antenna Coil (MW & SW)	1	New
L7	SLO-2P4	MW Oscillator Coil	1	New
L8	SLO-3P10	SW Oscillator Coil . . . SA	1	New
	SLO-3P6	SW Oscillator Coil	1	
L9	RLQ-C542-T	Trap Coil	1	
L10	SLT-6E2-D	Choke Coil	1	
L11	SLT-6G2-D	Choke Coil	1	
L12 & L13	ELQ-250A999	Noise Filter Coil	2	
T1	SLI-4B102	FM 1st IFT . . . Primary	1	New
T2	SLI-4B202	FM 1st IFT . . . Secondary	1	New
T3	SLI-4B202	FM 2nd IFT	1	New
T4	SLI-4B302	FM 3rd IFT	1	New
T5	SLI-4B502	FM Disc. IFT	1	New
T6	SLI-4B504	FM Disc. IFT	1	New
T7	SLI-2B102	AM 1st IFT	1	New
T8	SLI-2B202	AM 2nd IFT	1	New
T9	SLI-2B402	AM Det. IFT	1	New
T10	RLO-9C2-T	AC Bias OSC	1	New
T11	SLT-5J8D	Power Transformer	1	
COMPONENT COMBINATIONS				
M1	EXA-F203Z471	470Ω, 0.02μFZ (two) (AM)	1	
M2	EXA-5DL04C	4.7kΩ, 330pF (three) (FM)	1	
RESISTORS				
R10	ERD-14VJ100	10Ω 1/4 Watt ±5% Carbon	1	
R48, 77	ERD-14VJ220	22Ω 1/4 Watt ±5% Carbon	2	
R43	ERD-14VJ470	47Ω 1/4 Watt ±5% Carbon	1	
R2	ERD-14VJ560	56Ω 1/4 Watt ±5% Carbon	1	
R67	ERD-14VJ680	68Ω 1/4 Watt ±5% Carbon	1	
R74	ERD-14VJ820	82Ω 1/4 Watt ±5% Carbon	1	

REPLACEMENT PARTS LIST (Cont'd)

REF. No.	PART No.	DESCRIPTION				PER SET (pcs)	REMARKS
R7, 13, 11, 19	ERD-14VJ101	100Ω	1/4 Watt	±5%	Carbon	4	SA
R7, 13, 19	ERD-14VJ101	100Ω	1/4 Watt	±5%	Carbon	3	
R53	ERD-14VJ181	180Ω	1/4 Watt	±5%	Carbon	1	
R17, 23	ERD-14VJ221	220Ω	1/4 Watt	±5%	Carbon	2	
R44, 69	ERD-14VJ271	270Ω	1/4 Watt	±5%	Carbon	2	
R22	ERD-14VJ331	330Ω	1/4 Watt	±5%	Carbon	1	
R30	ERD-14VJ391	390Ω	1/4 Watt	±5%	Carbon	1	
R14, 18	ERD-14VJ471	470Ω	1/4 Watt	±5%	Carbon	2	
R72	ERD-14VJ681	680Ω	1/4 Watt	±5%	Carbon	1	
R3, 6, 12, 24 25, 41, 42, 66, 75, 78	ERD-14VJ102	1kΩ	1/4 Watt	±5%	Carbon	10	
R62	ERD-14VJ122	1.2kΩ	1/4 Watt	±5%	Carbon	1	
R16, 68	ERD-14VJ152	1.5kΩ	1/4 Watt	±5%	Carbon	2	
R4, 52	ERD-14VJ182	1.8kΩ	1/4 Watt	±5%	Carbon	2	
R20, 34, 40 59, 60	ERD-14VJ222	2.2kΩ	1/4 Watt	±5%	Carbon	5	
R65, 73	ERD-14VJ272	2.7kΩ	1/4 Watt	±5%	Carbon	2	
R5, 8, 15, 81	ERD-14VJ332	3.3kΩ	1/4 Watt	±5%	Carbon	4	
R9, 49,56,61	ERD-14VJ392	3.9kΩ	1/4 Watt	±5%	Carbon	4	
R32, 84	ERD-14VJ472	4.7kΩ	1/4 Watt	±5%	Carbon	2	
R64	ERD-14VJ822	8.2kΩ	1/4 Watt	±5%	Carbon	1	
R28, 37, 39 51, 70, 71	ERD-14VJ103	10kΩ	1/4 Watt	±5%	Carbon	6	
R1, 55	ERD-14VJ153	15kΩ	1/4 Watt	±5%	Carbon	2	
R50	ERD-14VJ183	18kΩ	1/4 Watt	±5%	Carbon	1	
R33, 76, 80	ERD-14VJ273	27kΩ	1/4 Watt	±5%	Carbon	3	
R58. 63	ERD-14VJ333	33kΩ	1/4 Watt	±5%	Carbon	2	
R79	ERD-14VJ473	47kΩ	1/4 Watt	±5%	Carbon	1	
R29,31,38,57	ERD-14VJ563	56kΩ	1/4 Watt	±5%	Carbon	4	
R82	ERD-14VJ224	220kΩ	1/4 Watt	±5%	Carbon	1	
R35	ERD-14VJ274	270kΩ	1/4 Watt	±5%	Carbon	1	
R36	ERD-14VJ474	470kΩ	1/4 Watt	±5%	Carbon	1	
R47	ERD-14TJ150	15Ω	1/4 Watt	±5%	Carbon	1	
R54	ERD-14TJ560	56Ω	1/4 Watt	±5%	Carbon	1	
R21	ERD-14TJ472	4.7kΩ	1/4 Watt	±5%	Carbon	1	
R46	ERM-12PK1R5	1.5Ω	1/2 Watt	±10%	Wire	1	
R45	ERM-12PK0R47	0.47Ω	1/2 Watt	±10%	Wire	1	

REPLACEMENT PARTS LIST (Cont'd)

REF. No.	PART No.	DESCRIPTION	PER SET (pcs)	REMARKS
CAPACITORS				
C12, 18, 30	ECC-D05010C	1pF 50WV ±0.25pF Ceramic	3	
C27	ECC-D05030C	3pF 50WV ±0.25pF Ceramic	1	
C1, 5, 22	ECC-D05040C	4pF 50WV ±0.5pF Ceramic	3	
C15	ECC-D05050C	5pF 50WV ±0.25pF Ceramic	1	
C11, 13	ECC-D05070D	7pF 50WV ±0.5pF Ceramic	2	. . . SA
C11	ECC-D05070D	7pF 50WV ±0.5pF Ceramic	1	
C13	ECC-D05150K	15pF 50WV ±10% Ceramic	1	
C3	ECC-D05180K	18pF 50WV ±10% Ceramic	1	
C6	ECC-D05390K	39pF 50WV ±10% Ceramic	1	
C32	ECC-D05470K	47pF 50WV ±10% Ceramic	1	
C40, 41	ECC-D05101K	100pF 50WV ±10% Ceramic	2	
C79	ECK-D05222MY	0.0022μFM 50WV ±20% Ceramic	1	
C19, 37	ECK-D05472MY	0.0047μF 50WV ±20% Ceramic	2	
C2, 8	ECK-D05102MY	0.001μFM 50WV ±20% Ceramic	2	
C16, 17	ECK-D05103MY	0.01μFM 50WV ±20% Ceramic	2	
C26, 87	ECK-D05223MY	0.022μFM 50WV ±20% Ceramic	2	
C9,14,54,55	ECK-D05103ZV	0.01μFZ 50WV +80% −20% Ceramic	4	
C23, 24, 28 31, 88	ECK-D05223ZV	0.022μFZ 50WV +80% −20% Ceramic	5	
C20	ECQ-S05301JZ	300pF 50WV ±5% Styrol	1	
C90	ECQ-S05361KZ	360pF 50WV ±10% Styrol	1	
C7	ECQ-S05331KZ	330pF 50WV ±10% Styrol	1	
C49	ECQ-S05681KZ	680pF 50WV ±10% Styrol	1	
C85	ECQ-S05821KZ	820pF 50WV ±10% Styrol	1	
C21	ECQ-S05222KZ	2200pF 50WV ±10% Styrol	1	. . . SA
C21	ECQ-S05332KZ	3300pF 50WV ±10% Styrol	1	
C74	ECQ-S05242KZ	2400pF 50WV ±10% Styrol	1	
C87	ECQ-S05472KZ	4700pF 50WV ±10% Styrol	1	
C66	ECQ-M05222MZ	0.0022μFM 50WV ±20% Polyester	1	
C60, 65	ECQ-M05472MZ	0.0047μFM 50WV ±20% Polyester	2	
C75	ECQ-M05153MZ	0.015μFM 50WV ±20% Polyester	1	
C84	ECQ-M05104MZ	0.1μF 50WV ±20% Polyester	1	
C83	ECQ-M05154MZ	0.15μF 50WV ±20% Polyester	1	
C48, 67	ECQ-M05223MZ	0.022μF 50WV ±20% Polyester	1	
C29	UKD-12J223M	0.022μF 50WV ±20% Ceramic	1	
C10, 47, 78	ECE-A25V1N	1μF 25WV Electrolytic	3	

REPLACEMENT PARTS LIST (Cont'd)

REF. No.	PART No.	DESCRIPTION	PER SET (pcs)	REMARKS
C59, 63, 69 70, 76	ECE-A16V3R3N	3.3μF 16WV Electrolytic	5	
C25	ECE-A6V33N	33μF 6WV Electrolytic	1	
C61, 68, 77	ECE-A6V47N	47μF 6WV Electrolytic	3	
C4, 46, 72	ECE-A6V100N	100μF 6WV Electrolytic	3	
C38, 82	ECE-A6V220N	220μF 6WV Electrolytic	2	
C39,50,62,86	ECE-A10V220N	220μF 10WV Electrolytic	4	
C45	ECE-A10V47N	47μF 10WV Electrolytic	1	
C71	ECE-A10V100N	100μF 10WV Electrolytic	1	
C33	ECE-B16V4R7N	4.7μF 16WV Electrolytic	1	
C42, 57	ECE-B12V220N	220μF 10WV Electrolytic	2	
C53	ECE-B16V1000N	1000μF 16WV Electrolytic	1	
C52	ECE-B16V2200	2200μF 16WV Electrolytic	1	
C51	ECE-B25Y3R3	3.3μF 25WV Electrolytic	1	
C43, 44	AL-10V1M	1μF 10WV Electrolytic	2	
C80, 81	AL-10V0.1M	0.1μF 10WV Electrolytic	2	
C64, 73	AL-10V0.47M	0.47μF 10WV Electrolytic	2	
C56	FM-501K	500pF 500WV Polyester	1	
		VARIABLE RESISTORS		
VR1	EVL-T0AA00B15	100kΩ, FM Tuning Level Control	1	
VR2	EVL-T0AA00B53	5kΩ, AM Tuning Level Control	1	
VR3	EVL-T0AA00B55	500kΩ, Howl Adjust	1	
VR4	EVC-B1AL20D54	50kΩ, Volume Control	1	
VR5	EVC-B1AL20D54	50kΩ, Tone Control	1	
VR6	EVL-T0AA00B25	200kΩ, Amp. Balance	1	
VR7	EVH-B0AL15A53	5kΩ, Level Control	1	
VR8	EVL-T0AA00B23	2kΩ, AC Bias Voltage Control	1	
		VARIABLE CAPACITORS		
CT1 ~2	PVC-2AF0038	Tuning Capacitor	1	
CT3 ~4	TD41RN10	Trimmer Capacitor	1	
		SWITCHES		
S1	ESR-E3C3L20BE	Band Selector Switch	1	
S2	ESR-E283L20AE	Function Selector Switch	1	
S3	SSH-8	Playback-LEC Selector Switch	1	
S4	SJE-34	Motor ON-OFF Switch	1	
S5	SWS-10	Motor ON-OFF Switch Ass'y	1	
S6	SST-8	Power Switch	1	

REPLACEMENT PARTS LIST (Cont'd)

REF. No.	PART No.	DESCRIPTION	PER SET (pcs)	REMARKS
S8	SSS-24	Speed Selector Switch	1	
SPEAKERS				
SP1	EAS-10P02S	10 cm PM Dynamic 4Ω,	1	
SP2	EAS-65PH34SB	6.5 cm PM Dynamic 8Ω,	1	
MOTOR AND PLAYER				
	FF-553D	Phonomotor with Governor Circuit	1	
	MHE-5BD	Motor with Governor Circuit	1	
	FF-TLW004	Circlip	1	
	SYE-10	Turntable with Mat with Trim	1	
	EPU-65LTA	Pickup with Cartridge	1	
	EPS-70LTC	Cartridge with Stylus	1	
	EPS-04LP	Stylus, Sappire	1	
MISCELLANEOUS				
	SDP-528	Pointer, Dial	1	
	SHR-696	Cushion, Level Meter	1	
	SJC-514	Battery Spring	2	
	SJC-118	Battery Terminal	2	
	SMY-40	Heat Sink	1	
	SMY-448	Heat Sink	1	ISO
	SMY-22	Heat Sink	1	
	SME-32S	Rest Lever	1	ISO
	SMN-182	Jack Holder	1	
	RDD-60-1	Dial Drum	1	
	RDS-417	Drum Spring	1	
	SDT-6184	Tuning Shaft	1	
	RDY-8	Pulley Shaft	2	
	RDR-8	Pulley	5	
	RDR-14	Pulley	1	
	SJK-5310	Battery Pipe	2	
	SUW-324	Bracket, Speaker	3	
	SHK-26S	Stud	1	ISO
	RVL-212-2	Pilot Lamp	1	
	SJJ-4	Earphone Jack	1	
	SJJ-28	Microphone Jack	1	
	SJJ-14	16 Pin Circuit Board Connector	1	
	RJP-14	Plug, Power Source Selector	1	

REPLACEMENT PARTS LIST (Cont'd)

REF. No.	PART No.	DESCRIPTION	PER SET (pcs)	REMARKS
	RJS-7S	Socket, Power Source Selector	1	ISO
	T-1012	Telescopic Whip Antenna	1	
	XSN3+15RSS	Chassis Mounting Screw	3	ISO
	XSN3+6RS	Chassis Mounting Screw	2	ISO
		APPEARANCE		
	SYP-22	Dial Assembly . . . SA	1	New
	SYP-20	Dial Assembly	1	New
	SBN-286-1	Tuning Knob	1	
	SBN-288-1	Volume Knob	1	
	SBN-290	REC Knob	1	
	SKK-70	Battery Compartment Cover	1	
	SKE-176	Cord Compartment Cover	1	
	SKH-10S	Handle Assembly	1	ISO
	SYE-38	Lock Assembly	1	
	SGX-504	Trim A, Escutcheon	1	New
	SGX-480	Trim B, Escutcheon	1	
	SGX-482	Trim C, Escutcheon	1	
	SGX-470	Trim, Motor Board	1	
	SGX-472	Trim A, Player Box	1	
	SGX-474	Trim B, Player Box	1	
	SGX-498	Trim C, Player Box	1	
	SGB-2	N Badge	1	
	SGB-316	Badge B	1	
	SGB-318	Badge C	1	
	SGB-320	Badge D	1	

REPLACEMENT PARTS LIST (Cont'd)

PART No.	DESCRIPTION & REMARKS		
	CABINET		
SKM-2140S*	Body ISO	Body, Complete (SYK-526) ISO	Cabinet, Complete (SYK-630S) ISO (SYK-626S) ISO . . . SA
SKM-2160	Side Board A		
SKM-2180	Side Board B		
SKM-2200	Top Board		
SYH-10S	Handle Ass'y ISO		
SKE-74	Pickup Holder		
SUW-326S	Bracket, Top Board ISO		
SUW-328S	Bracket, Body ISO		
SUW-330S	Bracket, Side Board ISO		
SBE-126	Holder, Lock		
SGW-1720	Side Panel		
SGB-316	Badge B		
SGS-72	Dirt Protector Sheet		
SKM-2240S*	Player Box ISO	Player Box, Complete (SYK-548S) ISO	
SYE-38	Lock Ass'y		
SBH-3014S	Hinge ISO		
SHR-694	Cushion, Hinge		
SGX-472	Trim A, Player Box		
SGX-474	Trim B, Player Box		
SGX-498	Trim C, Player Box		
SGB-320	Badge D		
SGB-2	N Badge		
SGS-934	Dirt Protector Sheet		
SKM-2220S*	Motor Board ISO	Motor Board, Complete (SYK-522S) ISO	
SGB-918	Badge C		
SHS-928	Dirt Protector Sheet A		
SHS-930	Dirt Protector Sheet B		
SHS-932	Dirt Protector Sheet C		
SGX-470	Trim		
SKF-1120*	Rear Cover	Rear Cover Complete (SYK-628) . . . SA (SYK-622)	
SKK-70	Battery Compartment Cover		
SKE-176	Cord Compartment Cover		
SBC-28	Button, Battery & Cord Cover		
SUS-26	Spring, Battery & Cord Cover		
SHS-926	Dirt Protector Sheet		
SGN-380	Specification Plate . . . . . SA		
SGN-382	Specification Plate		
SYP-22	Dial Ass'y . . . . . SA	Escutcheon, Complete (SYK-638S) ..... SA ISO (SYK-624S) ISO	
SYP-20	Dial Ass'y		
SGL-22	Panel Light		
SGX-504	Trim A, Escutcheon		
SGX-480	Trim B, Escutcheon		
SGX-482	Trim C, Escutcheon		
SGW-1700S*	Escutcheon ISO		

Note: Marked "*" parts in the above are to be ordered in the form assembly.

CASSETTE TAPE RECORDER REPLACEMENT PARTS LIST

REF. No.	PART No.	Q'TY	DESCRIPTION
1	SMQ-2	1	Chassis Ass'y
2	SMQ-14	1	Push Button Frame A
3	SMQ-20	1	Push Button Frame B
4	SMQ-16	6	Push Button Lever
5	SMQ-18	6	Spring A, Push Button Lever
6	SMQ-22	2	Button Collar
7	SMQ-24	1	Push Button Action Lever
8	SMQ-26	1	Spring B, Push Button Action Lever
9	SGS-188	1	Dirt Protector Sheet, Cassette Lever
10	SGE-246	1	Button Ass'y "REC"
11	SGE-244	1	Button Ass'y "REW"
12	SGE-242	1	Button Ass'y "FF"
13	SGE-240	1	Button Ass'y "PLAY"
14	SGE-238	1	Button Ass'y "STOP"
15	SGE-236	1	Button Ass'y "OPEN"
16	SMQ-281	1	Head Panel Ass'y
17	SMQ-301	4	Pulley A, Head Panel
18	SMQ-38	1	Pinch Roller Ass'y
19	SMQ-34	1	Spring C, Pinch Roller Ass'y
20	SMQ-42	2	Stud A
21	WY-223Z	1	Erase Head
22	SMQ-44	1	Stud B, Record-Playback Head
23	SMQ-46	1	Stud C, Record-Playback Head
24	SMQ-48	1	Plate Spring A
25	WY-027Z	1	Record/Playback Head
26	SMQ-50	1	Head Panel Action Bracket
27	SMQ-52	1	Spring D, Head Panel Action Bracket
28	SMQ-54	2	Bearing
29	SMQ-56	2	Head Panel Push Spring
30	SMQ-164	1	Brake Arm
31	SMQ-166	1	Spring E, Brake Arm
32	SMQ-168	1	Pivot, Brake Arm
33	SMQ-160	1	REC Safety Lever B
34	SMQ-170	2	Reel Ass'y
35	SMQ-186	1	Spring F, Reel
36	SYE-54	1	Cassette Case Ass'y
37	SMQ-180	1	Cassette Case Holder Ass'y (R)
38	SMQ-200	1	Spring G, Cassette Case
39	SMQ-184	1	Cassette Case Holder Ass'y (L)
40	SMQ-202	1	Spring H, Cassette Case
41	SMQ-188	1	Pop-up Lever
42	SMQ-192	1	Bracket A, Pop-up Lever
43	SMQ-194	1	Spring I, Pop-up Lever
44	SXE-10	1	Switch Holding Spring Ass'y
45	SMQ-142	1	Stopper, Lever (OPEN)
46	SMQ-146	1	Spring J, Stopper
47	SMQ-150	1	Lug
48	SMQ-124	1	Shaft A, Flywheel
49	SMQ-126	1	Bracket B, Shaft A
50	SMQ-128	1	Flywheel Ass'y
51	SMQ-134	1	Bracket Ass'y
52	SMQ-140	1	Belt, Capstan
53	SMQ-148	1	Washer, Oil Thrower
54	SMQ-58	1	Actuating Lever "FF"
55	SMQ-72	1	Spring K, Actuating Lever
55	SMQ-72	1	Spring K, Actuating Lever "FF"
56	SMQ-60	1	Shaft B, Brake Operating Plate
57	SMQ-62	1	Brake Operating Plate
58	SMQ-66	1	FF Idler Ass'y
59	SMQ-74	1	Spring L
60	SMQ-102	1	FF Operating Plate
61	SMQ-104	1	Shaft C, FF Operating Plate
62	SMQ-90	1	REW Arm Ass'y
63	SMQ-92	1	Spring M, REW Arm Ass'y
64	SMQ-70	1	Plate Spring B, REW Arm Ass'y
65	XWE-26E8	1	Washer, 2.6
66	SMQ-86	1	Holding Plate, FF Idler Ass'y
67	SMQ-88	1	Plate Spring C, FF Idler
68	SMQ-108	1	Takeup Arm
69	SMQ-106	1	Spring N, Takeup Pulley
70	SMQ-110	1	Clutch Wheel
71	SMQ-112	1	Clutch Felt
72	SMQ-114	1	Takeup Idler
73	SMQ-116	1	Spring O, Takeup Idler
74	SMQ-118	1	Cap, Takeup Idler
75	SMQ-120	1	Washer, Cap
76	SMQ-122	1	Rest Switch
77	SMQ-152	1	REC Safety Lever A
78	SMQ-154	1	Spring P, REC Safety Lever A
79	SMQ-158	1	REC Safety Spoke
80	MHE-5SD9S2	1	DC Motor
81	SMQ-196	1	Bracket C, DC Motor
82	SMQ-198	1	Pulley, DC Motor
83	XXA2A-3	1	Screw A, DC Motor
84	SUW-368	1	DC Motor Mounting Bracket
85	SMQ-64	3	2φ Nylon Washer
86	SNT-440	2	Circlip 1.2 m/m
87	SNT-442	3	Circlip 1.5 m/m
88	SNT-444	2	Circlip 1.9 m/m
89	SNT-446	1	Circlip 2.3 m/m
90	SMQ-204	1	Lug B
91	XWA26B	6	Spring Washer
92	SMQ-190	1	Spacer A
93	SMQ-162	2	Spacer B
94	XNG-26B	2	Nut 2.6 m/m
95	XSN17+4	1	Screw 1.7 mm x 4
96	XSN2+5	7	Screw 2 mm x 5
97	XSN2+12	3	Screw 2 mm x 12
98	XSN26+3	7	Screw 2.6 mm x 3
99	XSN26+4	8	Screw 2.6 mm x 4
100	XSN26+6	7	Screw 2.6 mm x 6
101	XSN26+8	2	Screw 2.6 mm x 8
102	XWE26A5	1	Washer
103	SMX-26	1	Insulated Sleeve
104	SMX-24	1	Insulated Sheet, Motor